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GAS JOURNAL

LIGHT ♦ HEAT ♦ POWER ♦ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. CXXXVIII. No. 2824.] LONDON, JUNE 26, 1917. [69th Year. Price 6d.

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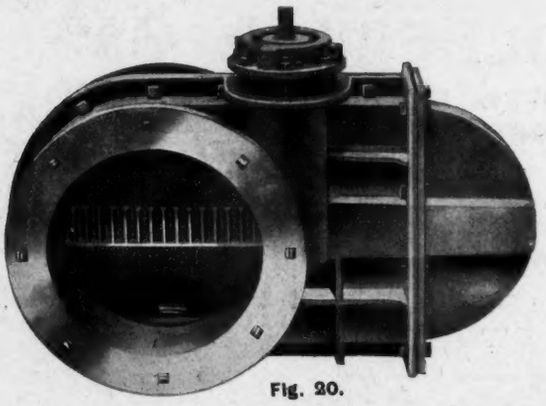

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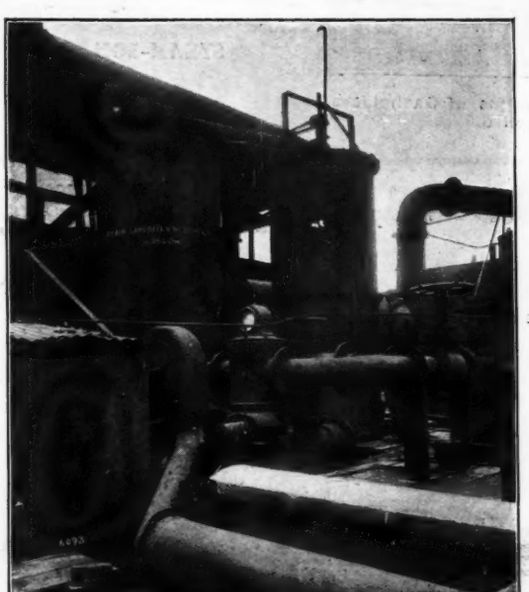

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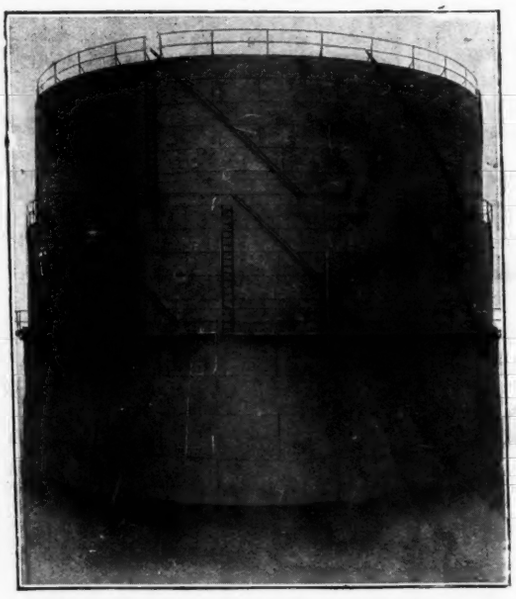

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Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

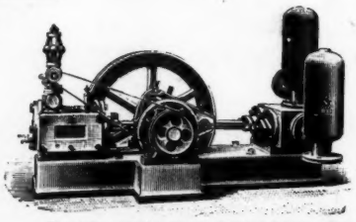

Fig. 685. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

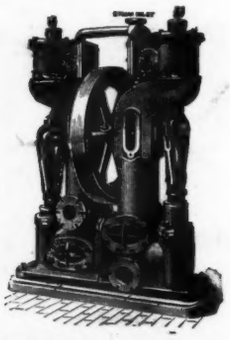

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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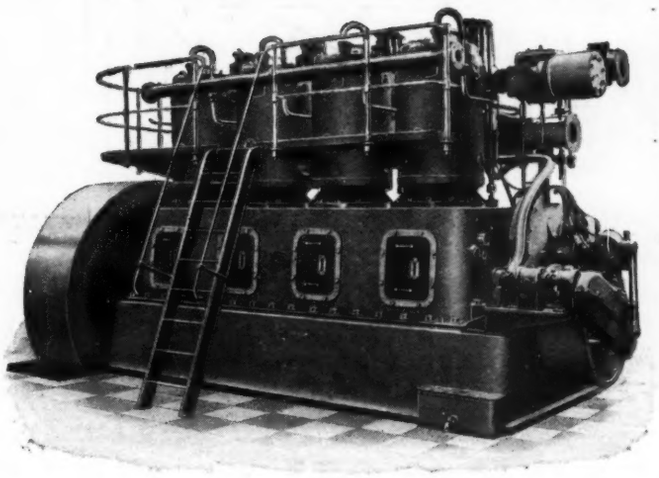

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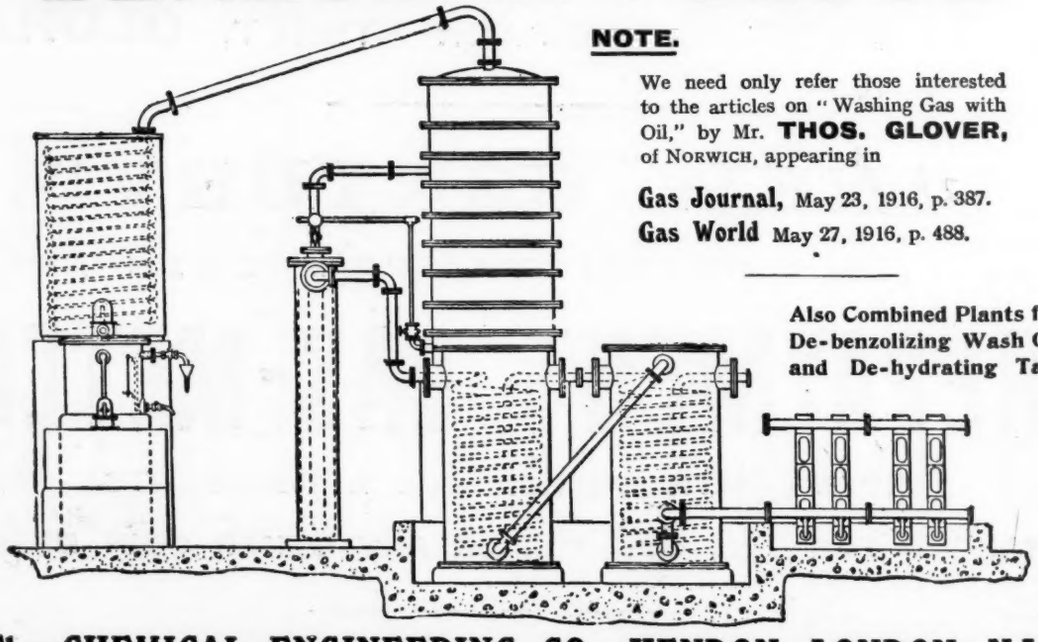

NOTE.

We need only refer those interested to the articles on "Washing Gas with Oil," by Mr. **THOS. GLOVER,** of NORWICH, appearing in

Gas Journal, May 23, 1916, p. 387.
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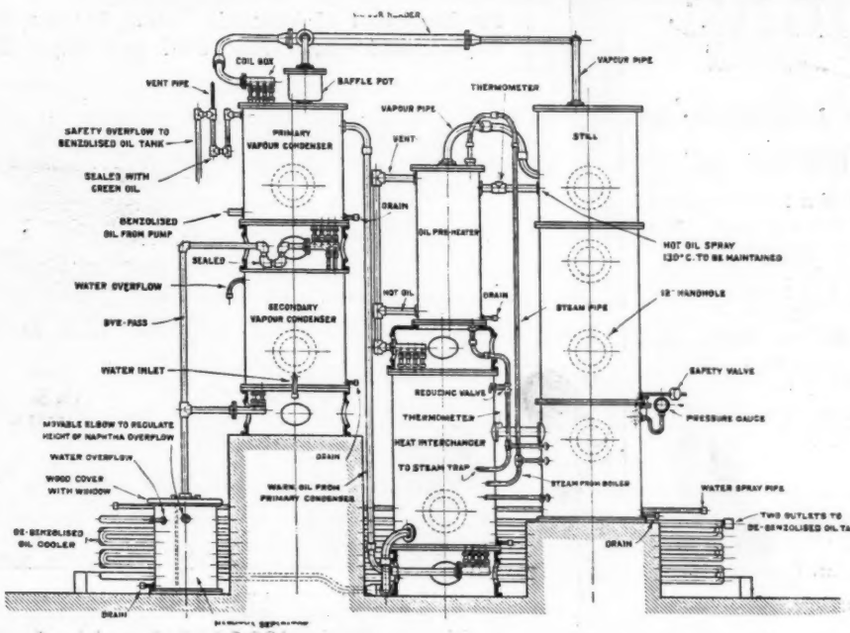

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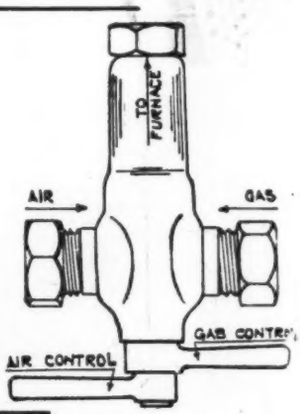

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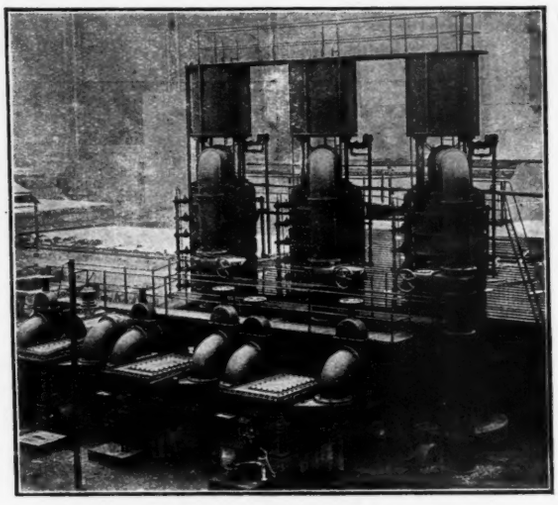

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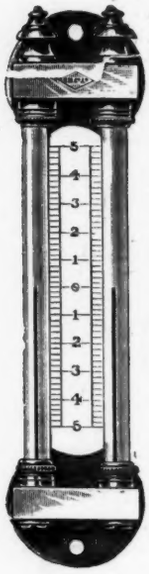

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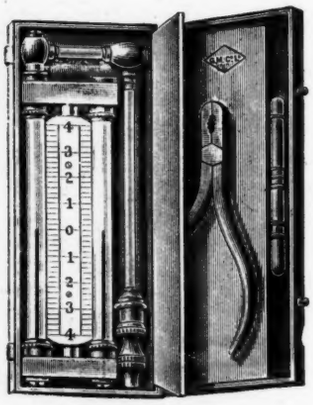

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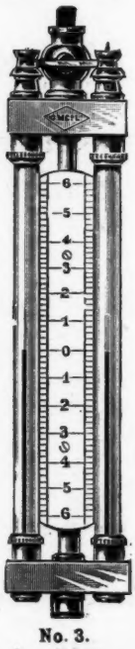

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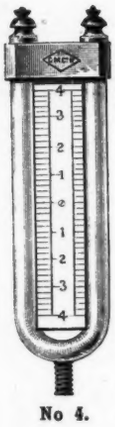

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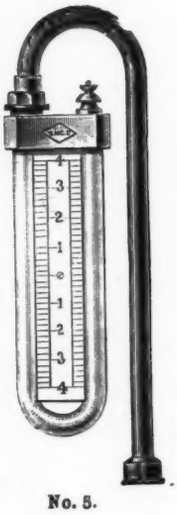

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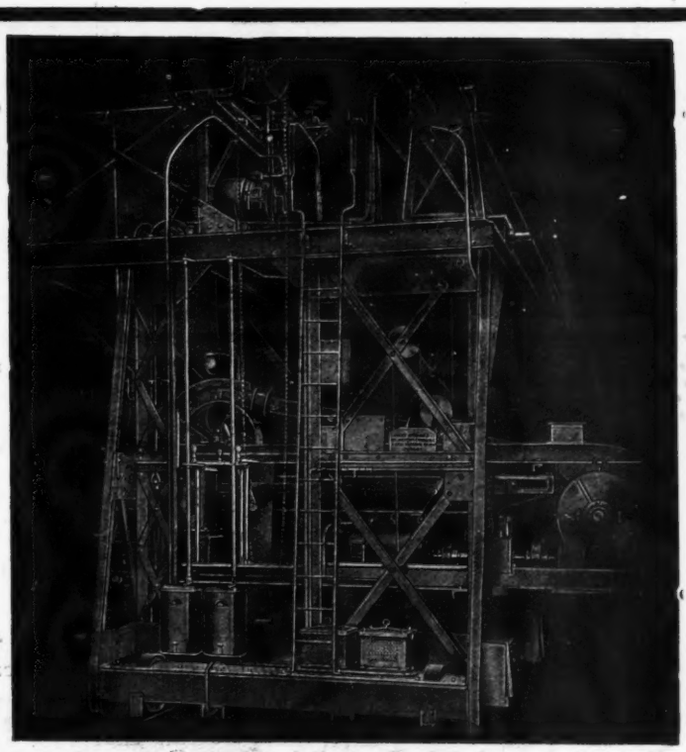

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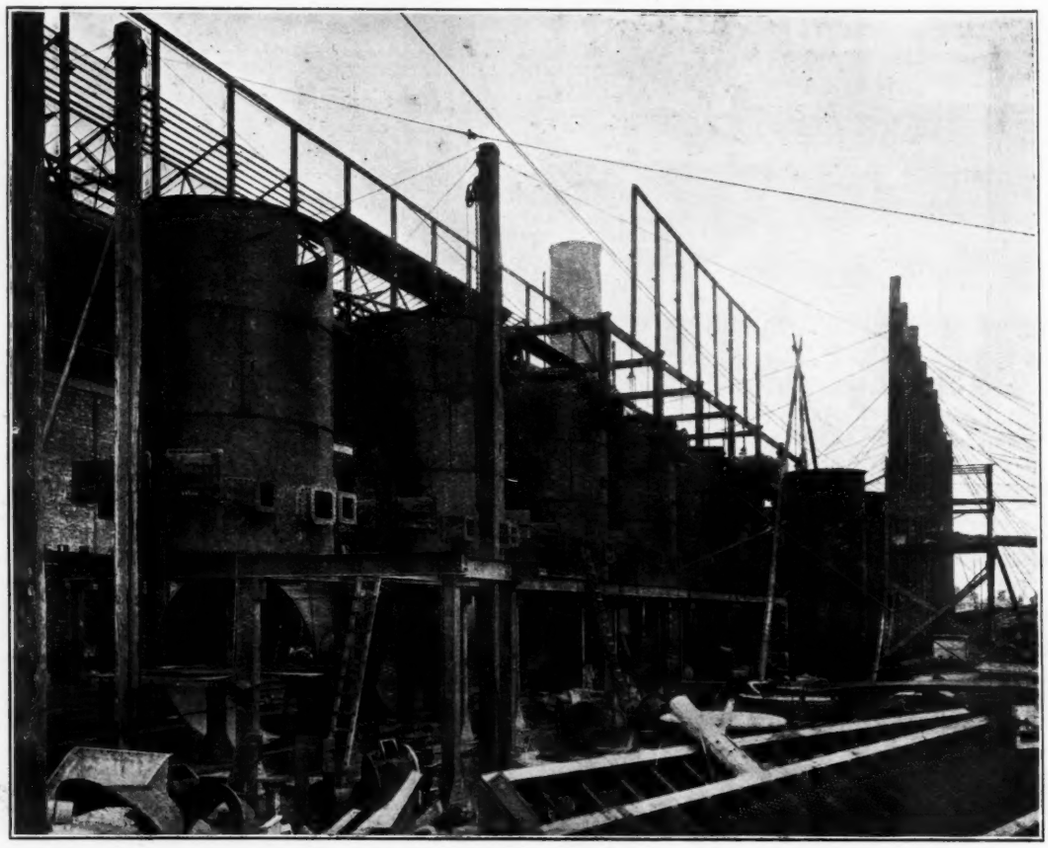

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CONTENTS.

EDITORIAL NOTES.

Restless War Changes and New Business Activity 613
Searching for a New Electrical Goal . . . 614
Spontaneous Ignition of Coal 615
Certified Occupations List—Virtue Rewarded—Benzol after the War—Coal Topics 616
Profitable Oil 617

City and Guilds Examination Passes . . . 617
Liquidation of the Imperial Continental Gas Association's German Works. 617
Personal 617
Obituary 618
Electricity Supply Memoranda 618
National Physical Laboratory 619
Mechanical Handling of Material 620
The Wrecked Holders at Ashton-under-Lyne 620
Women in Gas Offices 620
Nottingham Gas-Works Extensions . . . 622
Experiences in Distribution of Mixed Gases at Los Angeles. By N. H. Humphrys. . 623
A Discussion on Fuel Economy 624
Food Saving Campaign 626
Ignition Points of Liquid Fuels. 626
Measurement of High Temperatures . . . 626
Sixty Years Ago 627

REGISTER OF PATENTS.

Carbonizing Peat and Obtaining Distillates Therefrom—Whitfield, C. 627
Detecting the Presence of Combustible Gases—Philip, A., and Steele, L. J. 627
Furnaces Heated by Gaseous Combustion—Ionides, Jun., A. C. 628
Incinerator or Refuse Destructor—Creasey, H. H., and Davis Gas-Stove Company . . 628
Applications for Patents 638

PARLIAMENTARY INTELLIGENCE.

Progress of Bills; The British Incandescent Mantle Company; Coal Mines and Exemption; Departmental Committee on Electricity 628

LEGAL INTELLIGENCE.

Koppers Coke-Oven Patents. 628
Action against the Dublin Gas Company . 629
What is Cannel Coal? 629
A Director Sued 629

MISCELLANEOUS NEWS.

South Metropolitan Gas Company 630
The Hackney Preferential Charges Case . . 630
Co-Partnership 630
Stafford Gas Supply 630
Dundee Corporation Gas Accounts . . . 631
Oldham Corporation Gas Undertaking . . 631

MISCELLANEOUS NEWS (*continued*)—

Hebden Bridge and its Gas Supply . . . 632
Quality of the Gas at Coatbridge 632
South Suburban Company and Protection Cards 632
New Certified Occupations List 632
Spontaneous Firing of Coal 633
Fuel Regulations in Holland 634
Coal Gas for Motor Vehicles 634
Wrought Iron *v.* Steel Pipe 635
Current Sales of Gas Products 636
Coal Trade Report 636
Stock Market Report 637

PARAGRAPHS.

By-Product Coking—Redistribution of Coal Available for Steam-Boiler Purposes . . 617
Calorific Standard Orders 620
Austro-Hungarian Gas Association . . . 622
Institution of Gas Engineers 626
Gas in Hospitals 627
Scottish Gas Prices—Government Compensation for Explosion Victims 628
Gas Companies and Electricity Deficits—Salaries at Oldham 635
Wages Dispute at Ilkley—Gas the Cheapest Fuel for Bread Baking—Meter Inspector's Appeal Dismissed—Bingley Gas Undertaking 637
Price of Gas Increased at Maidstone—Fatality at a Birmingham Gas-Works—Gas Profits at Cleckheaton—Price of Gas at Doncaster—Satisfaction at Droitwich 638

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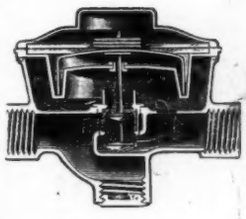

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CXXXVIII., No. 2824.] TUESDAY, JUNE 26, 1917. [69TH YEAR.

EDITORIAL NOTES.

Restless War Changes, and New Business Activity.

THERE are few—probably no other—industries that have had to face and deal with greater and more varied effects through the war than the gas industry, owing largely to the diversity and character of its purchasing and selling operations, and to the peculiar claims upon certain of its productions for the service of the nation and its Allies. As the war has proceeded, conditions for the industry have been anything but constant. They have assumed new shapes and new values—generally, with exceptions, more awkward and disadvantageous. At one time, it was thought—this was when the Price of Coal (Limitation) Act was passed—that there had at length been a settlement which would enable the industry under war conditions to gauge fairly well its position, and to cast forward. But human prescience and foresight are powers and prediction an act that are always subject to contingencies; and the contingencies that have come to upset calculations have been several and severe during the war. In 1915, for example, there were few exceptions to the rule of shortage of coal deliveries, low stocks, and, in the period of heaviest consumption, of stocks running nearly to the point of exhaustion. Thus it was that, especially in areas distant from the coal-fields, oil was used in considerable quantity for the making of carburetted water-gas. But during 1916 the conditions were reversed. The enormous rates for freights caused the price of gas oil to ascend to figures that forbade a continuation of carburetted water-gas manufacture in excess of what was absolutely essential. Coal again came into larger use, but at increased price, owing to (in some cases) higher charges for coal notwithstanding the price-limiting Act, to higher costs for conveyance and handling, and to arrears in deliveries, which necessitated, in order to assure uninterrupted gas supply, the purchase of coal by many undertakings at open market rates. All the same the manufacture of carburetted water-gas was dearer than that of coal gas, so there was a reduction in the total quantity of oil used, while the amount of coal carbonized increased—in London above 1915, and in the Suburbs and Provinces to well above the figure for the pre-war year of 1913. To-day, a still further change in gas-making history is being effected. For in part the same reason—the shortage of oil and heavy freights—there is a very substantial reduction not only of the total volume of oil used for gas-making, but of the quantity expended per 1000 c.ft. of carburetted water-gas manufactured. But the shortage and price of oil is now supplemented by the need to economize in coal carriage; and so the change has gone beyond the sparing use of oil for the making of water-gas to the production of blue water-gas for mixing with coal-gas. In this, there is the opening to large possibilities for the future—in short, a necessity only created by the war may become a permanent practice, and a good contributor to the economic situation in the industry. Perhaps there may, in the immediate future, through external circumstances, be a still further change—of temporary order, however. The industry has, indeed, been very much the sport of Dame Fortune, who has been put into reckless mood by the inconstancies born of the war; and therefore while we may all of us devoutly hope for greater repose of circumstances, there is not, judging by precedent, the slightest use in anticipating it while the war continues.

While on the one hand there have been—in the directions instanced, as well as in others—these fluctuations in procedure and costs through externally formed conditions, and while, on the other hand, much of the revenue of the industry has been controlled directly or indirectly (which has kept it free from profiteering, but not free from damage to its reputation for providing a fairly reliable evenness of dividend), it has been, during the war period, extending its business connections at a good pace, and would have done even greater things in this way had more capital, men, and materials been available to it. There is a satisfaction in knowing that while these resistances to the current of business accretion have been against the industry, there have been good features which will help it, apart from its own internal exertions, to "make good" in future. "Field's "Analysis for 1916"—edited by Mr. H. E. Ibbs, the Accountant to the Gas Light and Coke Company—has lately come to hand; and its statistical tale (only partial survey is made of the industry, but the result is typical) is far-reaching. It takes us to still higher war costs all along the line; it tells us in figures of the revolution in the industry's affairs—the brightest side of the story being that which informs as to added consumers, a stiffening-up of the consumption after business-depriving restrictions caused a set-back, and the excellent work that the secondary products have done in attempting to counter the strain of extraordinary costs. The figures cannot be reviewed here in detail; but some of the salient ones may be mentioned to illustrate the points already put forward. Take first consumers and consumption. The three Metropolitan Gas Companies, at the end of last year had 1,317,666 private consumers, which gives a war-period increase (taking 1913 for comparison) of 61,075. The eight Suburban Gas Companies had 442,012 private connections at the end of last year, which number was reached by "linking-up" 50,380 new customers during the war. Eleven Provincial Corporation concerns whose statistical history is set out ended last year with 928,042 consumers, having booked 50,776 new ones while the war has been on. The nine Provincial Gas Companies have in the same period, by the addition of 28,842 consumers, run up the number of their private customers to 508,413. Through these new consumers, and the increased installation of stoves, furnaces, engines, and other gas-consuming appliances, we see the three London Companies gradually creeping up in consumption, despite lighting restrictions, to the sales line of 1913; while the Suburban Companies and the Provincial Corporations and Companies are greatly in excess. This is a remarkably healthy state of things, having regard to the increase in the charges for gas.

Let us give the actual figures. The three Metropolitan Companies in 1916 sold 43,270,805,000 c.ft. of gas; and in 1913, 43,922,191,000 c.ft. Thus a further increase of 651,386,000 c.ft. would establish an equilibrium with 1913, and a figure of this size is not an uncommon variation in a year for the Metropolitan Companies, according to the character of the seasons. The eight Suburban Companies have mounted up from their sale of 12,542,193,000 c.ft. in 1913 to 14,160,739,000 c.ft. last year. This excellent showing is continued by the eleven Provincial Corporations and nine Companies. The sales by the Corporations amounted to 27,768,134,000 c.ft. in 1913 and to 29,826,085,000 c.ft. in 1916. From the details, we must single out Birmingham, which sold last year 2,000,540,000 c.ft. more than in 1913—its total output being 10,660,271,000 c.ft., compared with 8,659,731,000 c.ft. The Provincial Gas Companies sold last year 18,553,057,000 c.ft., compared with 16,863,128,000 c.ft. in 1913. The effect of the lighting restrictions is seen by the reduction in London of the average consumption of the ordinary consumers from 68,410 c.ft. in 1913 to 65,587 c.ft. in 1916. But the consumption of prepayment consumers last year averaged 16,524 c.ft., compared with 16,516 c.ft. in

1913. The 1916 averages show a strong increasing tendency on 1915. But all through the war, the averages of the consumers of the Suburban and Provincial undertakings have made marked progression. The average of the Suburban Companies for ordinary consumers rose from 50,966 c.ft. to 52,918 c.ft., and for prepayment consumers from 18,045 c.ft. to 18,347 c.ft. The Corporations have gone from 40,761 c.ft. for ordinary consumers in 1913 to 43,073 c.ft. in 1916; and the prepayment consumers from 13,159 c.ft. in 1913 to 14,953 c.ft. in 1916. The Provincial Gas Companies have marched from an average for their ordinary consumers of 46,845 c.ft. in 1913 to 50,824 c.ft. in 1916; while their prepayment average has risen from 14,304 c.ft. in 1913 to 15,927 c.ft. in 1916. From the figures, it will be seen that London still leads in the averages per ordinary consumer. But though London has suffered acutely from the lighting restrictions, the large industrial centres (particularly in the North) have had the advantage of a compact addition through the demands made for munition purposes; and the spending power of the people using prepayment meters has been at a higher level.

This is all very satisfactory in the progressive business that it reveals. But, though welcome, it has been business gained on the back of dear costs. There is the equally interesting war side as to the fluctuations in the use of coal and oil in the changed circumstances. Last year it is remarked the three Metropolitan Companies carbonized 3,114,664 tons of coal; the Gas Light and Commercial Companies supplementing their coal by the use of 15,415,363 gallons of oil. The alteration in procedure through the changed conditions in 1916 in respect of imported oil is seen by the fact that in 1915 the lower quantity of 2,866,775 tons of coal was carbonized, while the use of oil was up to 22,597,203 gallons. Thus there was a shrinkage last year in oil consumption of upwards of 7 million gallons. The proportion of carburetted water gas used by the two Companies in 1915 was 20 p.ct. and in 1916 16 p.ct.; and the average oil consumed per 1000 c.ft. of carburetted water gas was 2·42 gallons in 1915, as compared with 2 gallons in 1916. The quantity of coal carbonized by the three Metropolitan Companies in 1913 was 3,300,171 tons. Much the same tale has to be told in regard to the Suburban group. The quantity of coal carbonized last year by these Companies was 902,609 tons, compared with 795,284 tons in 1915, and 847,813 tons in 1913. Some 3 million gallons more oil were used in 1915 than in 1916—the figures being 10,942,285 gallons and 7,907,939 gallons respectively. The proportion of carburetted water gas supplied was in 1915 equal to 32 p.ct. and in 1916 to 26 p.ct.; while the oil consumption per 1000 c.ft. of gas was equal to 2·3 gallons in 1915 and 1·98 gallons in 1916. When Mr. Ibbs comes to deal with the corresponding figures next year, he will, we think, find a very considerable difference in the average use of oil per 1000 c.ft. We need not give the figures of the Provincial concerns. More coal was carbonized by them last year than in either 1915 or 1913; but the Provincial Corporations varied the oil tale by using less in 1915, while the Provincial Companies maintained it by using last year 1,183,506 gallons of oil less. The tendency had also set in in the provinces to a lower use per 1000 c.ft., and the compulsion of circumstances has prevailed since. The average percentage use of carburetted water gas in the provinces has not varied much during the war. But when differences are found as between 1 and 23 p.ct., 6 and 20 p.ct., 2 and 19 p.ct. in the case of Corporations, and 3 to 38 p.ct., 4 to 40 p.ct., and 1 to 44 p.ct. for the Companies, one loses some respect for the lessons to be derived from averages.

We will conclude with the figures as to the average cost of raw material, and the net cost after deducting receipts for secondary products. In the Metropolitan group, the average cost of coal (including oil and spirit) was in 1916 24·53d. per 1000 c.ft., and the net cost 9·18d.; in 1915, 19·24d. and 8·64d.; in 1913, 15·67d. and 4·51d. The figures for the Suburban class were: 1916, 23·51d. and net 12·36d.; 1915, 18·17d. and 9·71d.; 1913, 16·62d. and 6·85d. For the Provincial Corporations the figures were: 1916, 18·06d. and net 6·92d.; 1915, 14·17d. and 5·95d.; 1913, 12·96d. and 2·62d. For the Provincial Companies (which show considerable differences according to their distance from the coal-fields), the average costs were: 1916, 20·42d. and net 8·19d.; 1915, 15·93d. and 6·18d.; 1913, 14·96d. and 4·87d. Looking at the figures comparatively, one sees the considerable advantage in the matter of coal supplies that the Provincial Corporations up North have over the London and Southern undertakings. Investigating them, too, year by year, there stand out markedly the influences of higher coal and oil costs, as well as (good as their contribution has been) the inability of the residuals to do more than lighten them.

Searching for a New Electrical Goal.

THE electricians are at the present time wandering about in search of a goal, without any effective guidance. The goal itself is definite enough. It is to realize generating economy, and to simultaneously assist the nation in "fuel economy." The former is a natural desire; the latter a pious one. But the electricians talk at random on the subject; and in the discussions now taking place—especially where coal carbonization and product recovery questions are spoken of—one is constantly running-up against misunderstandings and technical errors and absurdities that suggest the wisdom, before the rank-and-file further deliberate over matters beyond their cognizance, of the electrical industry instituting a thorough investigation by a Joint Committee of electrical engineers and coal carbonizers. At the same time, the crude discussion that occurs in print and at meetings is perfectly harmless, as, fortunately, the Government are not likely to allow the industry to go rushing into visionary schemes without considering the whole aspects of the question, and the industry itself is not in a condition to make any revolutionary conversion of its practices. The "Electrical Times," for instance, has got wind of the fact that the Board of Trade Departmental Committee is not the only body charged with deciding the fate of the electricity industry. There are Government appointed bodies, it says, considering coal and reconstruction questions; and these, it adds, have not been by any means idle, and their policy should be scrupulously examined. Let us hope they are setting about their work in better manner than those electrical men who write articles and compose papers that are partly a *réchauffé* of former publication, and that contain misstatement of facts and deductions based on altogether wrong premises.

Among the papers read at the meeting of the Incorporated Municipal Electrical Association last week was one by Mr. J. A. Robertson, the Borough Electrical Engineer of Salford, who seems to have satisfied himself that in centralization of electricity generation, and possibly coal carbonization and the recovery of secondary products, the way has been found to the supremacy of electricity over all other methods of providing light, heat, and power. Although he has a leaning towards coal carbonization, on account of the products being as necessary to industry as (say), electricity, if not more so—inasmuch as in a good many industries electricity would not be required if they had not the fundamentally requisite products of coal carbonization—he has a little lurking uncertainty as to the future of the bye-products markets; and he suggests there should be strict inquiry in this direction. This is a sensible course, in conjunction with which there is some satisfaction, after reading Mr. Robertson's paper, to find that he does not detect in any of the carbonization processes an efficiency equal to, or others with a suitability for combination with electricity generation greater than, that practised by gas undertakings. The paper, however, does not commend itself to us for its accuracy in many important details which have a bearing on the prospective "walk-over" that some imaginative electrical men believe is to be the fate of electricity supply. Certain figures in the paper were corrected by speakers during the discussion; and there are others that need amending or qualifying. In passing, too, we notice that, in speaking of the secondary products of coal carbonization, the author twice refers to "toluolene" [*sic.*]

An abstract of the paper appears in this issue; and it will be observed that Mr. Robertson sees, even in the present state of electrical knowledge as to economical generation, large potentiality for electricity in both the power and heating businesses, although he confesses that, after the best has been said, the electrical generating process has a poor thermal efficiency. But when the good time comes when there is a national centralized system of electricity production, the industry will, despite the low thermal efficiency of its system, save the country no less than 30 million tons of coal per annum for factory and domestic purposes alone. Whether there is going to be any real balance of benefit for the country in this is not exactly clear from the paper; for, on hypothesis alone, the author advances the opinion that this would be amply sufficient to meet the charges on the

capital expended, and also to compensate all the existing interests which might be adversely affected. This is a bit vague. Something much more than such generalization is required; for the author considers the matter almost exclusively from the point of view of fuel, and fuel in any large centralized electrical scheme with high-pressure transmission is only one out of several important cost factors. But regarding the thermal efficiency of the gas-works process, it is a bad feature in a man's case when he can be convicted of making comparisons with the best standard of working on his own side and not the average, while putting the case of the competitor in less favourable light. He concedes that the thermal efficiency of the gas-works process "may be" 65 or 70 p.ct., whereas the thermal efficiency of power stations is in the neighbourhood of only 8 or 9 p.ct. Then side by side he makes a comparison with the gas-works process, which attributes to electricity power stations a coal consumption of only 2½ lbs. per unit, while this is a consumption that is rare to-day—the average being more like 4 to 4½ lbs. If the 2½ lbs. becomes a general figure, it will be in the distant future. But with this consumption, the thermal efficiency of the electricity generating process is only 11 p.ct. In the comparison for gas-works, he adopts a low scale of working. He takes a production of only 11,000 c.ft. of gas per ton of coal, while many gas-works are producing, or were with pre-war coal, between 12,500 and 13,000 c.ft. The average make of all the statutory gas undertakings, good, bad, and indifferent, was shown by the last Board of Trade returns to be 11,645 c.ft.; and with an industry dealing with about 18 million tons of coal a year, a few hundred cubic feet of gas per ton extra means a large aggregate in B.Th.U. He also computes a production of 9 cwt. of coke; whereas about 12½ cwt. is the amount, or deducting (say) 2½ cwt. for fuel for retort-heating, this gives a net quantity for sale of approximately 10 cwt. To this coke he only attributes a heating value of 9500 B.Th.U. per lb., while a respectable coke (when coal is supplied with a reasonably low percentage of ash and dross) will give about 14,000 B.Th.U. He can only find it in his heart to accord to 10 gallons of tar a heating value of 1,550,000 B.Th.U.; and nothing is allowed for the heating value of the pitch. Thus it will be seen that, though he admits a thermal efficiency of 64 p.ct. for the gas process, the low basic figures he takes deprive the process of part of the credit actually *in esse* and not as in the case of electricity *in futuro*.

There is another matter to which we would draw the attention of Mr. Robertson and his colleagues. This is in connection with power. He points to electrical concerns with a consumption of 3·2 lbs. of coal per unit giving a horse-power-hour for 2·4 lbs.; so saving a large amount of coal by the turning-over of private-power plants to the central station, which private-power plants, he assumes, would use to-day an average of 4½ lbs. per horse-power-hour. Prospectively, when [when?] the ideal state is attained, an electric horse-power-hour is anticipated on a consumption of 1·09 lbs. of coal. It has just been seen that of the ton of coal as carbonized in gas-works, only ½ ton is expended in the making of gas and liquid products, as well as the extracted sulphur, and that ½ ton of solid fuel—practically all fixed carbon—remains. Using a modern gas-engine, running full load, 16 cubic feet of average town gas give a brake-horse-power-hour; so 781 B H.P.H. are realizable from 12,500 c.ft. of gas, to produce which gas (with the liquid products) one-half of the substance of the ton of coal has been expended. This is equivalent to 1·43 lbs. per B.H.P.H. and under present conditions. The ½ ton of coke could also be gasified to produce about 30,000 c.ft. of gas, over 90 p.ct. of which would be combustible, with a calorific power of some 300 B.Th.U. per cubic foot. Now perhaps our electrical friends will see the open door to further work for the gas industry in the provision of gaseous fuel for power and heating; so adding to the national economy in a much more expeditious manner than, chained down as it is to its present capital expenditure, the electrical industry can do, and without large concentrations of plant and the provision of a network of high-pressure transmission mains.

There are other points about which Mr. Robertson should satisfy himself before indulging in any more fanciful performances in relation thereto. We are not advocates of the use of coal for heating; but we are far from indulging in any such foolishness, in respect of the domestic use of coal, as stating that "it is questionable if the efficiency—the ratio "of heat units actually utilized to the heat units contained "in the coal consumed— is more than 5 p.ct." We should also like Mr. Robertson's authority for making the ridiculous assertion that "it is doubtful if the actual efficiency of "gas-fires is more than 10 or 12 p.ct.," when tests of modern gas-fires made by scientific means, by men of great repute in the scientific world, show that of the B.Th.U. developed by the combustion of the gas only about 25 to 30 p.ct. ever passes away *viâ* the chimney. When the most modern instruments for directly measuring the radiant efficiency of fires show round about 50 p.ct., and the waste gases disclose the passage by the chimney of (say) 25 per cent. of the heat of combustion (helping enormously ventilation) then the balance is communicated to the room by convection or conduction. And the calorific value of gas is cheaper far than the calorific value of the electricity for which equal payment is made. It is idle to talk of the relative efficiencies of heating instruments without considering the amount of thermal value supplied to them for a given sum. As it happens, the gas-fire is not only fed with cheaper B.Th.U. than the electrical types, but it has a demonstrable high efficiency—70 to 75 p.ct. One other point. Mr. Robertson indicates his "knowledge" of carbonizing processes by some confusion between the temperatures of coking practice and low-temperature carbonization. He remarks: "The distillation of coal at low temperatures for "the primary purpose of producing metallurgical coke, and "yielding in addition a quantity of surplus gas of high "calorific value in addition to other bye-products, has been "advocated in certain quarters as a universal solution of "the fuel economy problem." We will not comment on the construction of the statement, but merely say that the coking process for making metallurgical coke is a high-temperature one. If it were not, there would be no use for the resultant coke for metallurgical work.

There are other matters in the paper which invite criticism; but we will stop here, with the question as to how much Mr. Robertson's paper and the discussion has helped forward the ambition of the electrical industry to attain a goal of higher economy in the utilization of fuel and of larger service in the work of the country? What it has done has been to show a deplorable shortage of correct information on important matters that have a distinct bearing on the main question.

Spontaneous Ignition of Coal.

FROM time to time we have dealt with the work on the spontaneous firing of coal which has been carried out at the Doncaster Coal Owners' Research Laboratory—mainly by Mr. T. F. Winmill and Mr. J. Ivon Graham, with the advisory help of Dr. J. S. Haldane, F.R.S., the Director of the Laboratories. This work, as we have freely recognized, has been of immense value not only to coalowners, but to large buyers of coal who have to store against heavy consumption, short deliveries, or emergencies of various kind. It has elucidated several points; it has shown us where old theories have been at fault; it has given us real scientific knowledge as to the reason for the success of preventative methods against spontaneous firing which have been applied as the result of the lessons solely drawn from trial and error. The detailed chemical and physical investigation that has been made enables those who examine into the chemical and physical condition of their coals to adopt those methods of prevention which are likely to be most satisfactory. At the recent meeting of the Institution of Mining Engineers, Dr. Haldane reviewed the results of the work done at the laboratories; and, while there are other problems still claiming research, the results so far achieved are directive in a satisfactory degree. Put generally, the spontaneous firing of coal is due to oxidation occurring under such conditions that the heat formed by the oxidation cannot escape as rapidly as it is generated. The oxygen is taken up by coal in two ways—first, the coal combines chemically with oxygen, evolving much heat in doing so; and, secondly, in a manner apparently analogous to simple solution of gases in liquids, and without sensible evolution of heat. It is therefore the chemical combination that spells danger. As the heating of some of the constituents of coal increases (certain of them are not liable to oxidation until subjected to a rise of temperature), their avidity for taking-up oxygen also increases; and thus the cumulative process goes on until the critical point is reached.

Many are the practical lessons in this work. For example, we have seen in certain gas-works the whole of the coal put into store passed through an outside coal-breaker,

which, of course, brings the coal into a condition conducive to greater oxidation. This is a mistake. The coal should be placed in store as large as possible, and broken as it is taken from store, just before being elevated to the overhead coal-hoppers—especially in these days when larger quantities have to be stocked, and be kept probably for several months. The rate at which oxygen from the air passing through coal combines with it is dependent on the fineness of the subdivision of the coal; and at any time largeness of coal is a good preservative, as oxidation is much slower and the time required for complete oxidation much longer. As we showed in a former article, as the result of the work at the Doncaster Laboratories, when thin slices of coal were subjected to test, it was proved that the rate of the passage of gas through them was very slow. Intact coal is, in fact, a highly gas-tight material. This is very important, as, apart from the question of oxidation and heating, it shows that for gas-making purposes large coal has its qualities better preserved than fine coal. Another valuable point is that the greater the oxidation, the greater the loss of the coking property of coal. From every point of view, therefore, gas and coke makers are concerned in minimizing the oxidation process by keeping dust in the coal stored at as low a quantity as possible. In large mass storage, too, the heat produced by oxidation is conducted from layer to layer; and so there is a cumulative but an unequal rise of temperature throughout, and to a degree that could not occur in a small mass, the temperature of which would be more or less equalized by conduction. These are among the practical lessons that such work as that carried out at Doncaster presents to those who have to buy and store coal in large quantities; and coal proprietors as well as users are under an obligation to the Doncaster coalowners for the free publication of the results of the valuable work that has been prosecuted at their laboratories, under the direct guidance of Dr. Haldane.

Certified Occupations List.

Previous lists of certified occupations are superseded by a new one [R. 136] just issued, which, as hitherto, is confined to questions of exemption coming before Tribunals, and is not affected by the Schedule of Protected Occupations. On this occasion a new section has been added, pointing out that a man is not entitled to claim to be employed or engaged in a certified occupation unless that is his principal and usual occupation, and defining the position of men working on their own account, and of working employers, when they are engaged in certified occupations. Men under the age limits stated in the list who are classed for garrison duty at home will no longer be entitled to be treated as in a certified occupation (except in agriculture) on and after July 23. Various trades and occupations have been removed from the list; and in many cases where "all classes of workmen" or "all other classes of workmen" are reserved, the reservation has been limited by adding the words "except unskilled men." Then, the age limits for foremen, departmental managers, and overlookers have, in almost all cases, been raised to 31 for both single and married men. The reference made in the list to men in gas-works will be found reproduced in the news columns of this number. There are also some additions to the list. The wording of the part relating to coal mining has been altered to bring the reservation into harmony with the latest Home Office orders; while as regards metal manufacture the reservations have been re-cast, in accordance with the classification in the Schedule of Protected Occupations. As to other engineering works and foundries, all classes of foundries are now included; but reservation is restricted to workmen (except unskilled men) engaged in manufacturing, erecting, or repairing machinery or plant for use in trades or services named in the list. The reservations for the chemical and dye-stuff trades have been re-cast; and the reservation referring to Local Government officials does not apply to officials of municipal trading undertakings.

Virtue Rewarded.

It is observed that at the special meeting of the Institution of Gas Engineers to be held early in July, Mr. D. Milne Watson, the Managing-Director of the Gas Light and Coke Company, is to be submitted for election as an honorary member. He deserves the honour; for, during these years of pressure and anxiety, few men have done more work for the industry that has entailed much encroachment on time than Mr. Milne Watson. As Chairman of the Executive Committee of the National Gas Council and as Chairman of the Sulphate of Ammonia Association, and in many ways in which labour and effort have received no publicity, he has quietly and influentially served the industry. It could, in the circumstances, well be wished that his name had appeared in the group of honorary members submitted at the annual meeting. It is hoped that now no one will be so uncharitable as to think this is a ruse on the part of the Council of the Institution to win Mr. Milne Watson over to their headquarters' proposal. He showed himself, at the National Gas Council meeting, strongly opposed to a headquarters' scheme in which the Institution should alone have ownership and thus supremacy. The day has long passed for that. His idea was that headquarters should be not for the Institution only but for the gas-supply industry generally; and it was on his proposal a resolution to that effect was passed by the Gas Council. To the larger scheme the resolution and his speech pledge Mr. Watson; and this action cannot be a sufficient cause, in the opinion of the Council of the Institution, for his nomination as an honorary member. No publication has yet been given to the names of the members of the independent Committee Mr. Watson desired should inquire into the subject as a result of the resolution passed by the Gas Council.

Benzol after the War.

From time to time, there have been suggestions through the "JOURNAL" and elsewhere that there should be formed a Benzol Producers' Association, for the purpose of protecting the interests of makers subsequent to the war. The gas industry has become deeply interested in this matter; and there is no intention of letting, after the educative experience forced by the war upon a willing industry—willing for the country's sake, but at the time for no other—to let the recovery plant that has been installed fall into an inactive and useless state. The National Gas Council are considering this matter; and, in their recent report, it was stated that the question of the utilization of benzol after the war is receiving the careful attention of the Executive Committee, with a view to the gas industry obtaining a market for this product as a motor spirit and "for other purposes" on reasonably remunerative terms. The Executive also announced that they hoped to publish shortly a standard specification for the production of benzol for use as a motor spirit, which is essential to the creation of a permanent market. Opinions are divided as to whether gas undertakings should cultivate the dye industry or the motor industry. The former will need all possible help. So will the gas industry; and it has to consider its own interests. In considering them, questions of permanence of patronage and competition have to be taken into account. And certain it is that, as soon as tank-steamers are again released and more new ones are afloat, the oil magnates will see to it that any competitor with their petrol shall be met with proper resistance. Meanwhile an opportunity of investigating prospects in connection with the dye industry is offered through the temporary department of the Board of Trade that has been established to deal with matters relating to the encouragement, organization, and, as far as may be necessary, the regulation of that industry. Sir Evan Jones, Bart., M.Inst.C.E., is to direct the department, and will bear the official title of Commissioner for Dyes.

Coal Topics.

The financial basis on which it is proposed that the control of coal mines shall be conducted by the Government is in draft form. It has been under the consideration of the local coal associations, and last Thursday was discussed by the Council of the Mining Association. The terms are to be kept confidential, until officially divulged. But it is known that the Coal Controller has not succeeded in pleasing everybody. He would be a wonderfully clever man could he manage that. Meanwhile, his scheme for a gradual geographical redistribution of coal is being set to work; but it will, of course, take a little time for it to settle down into smooth working order. The novelty of the whole thing is making many coal men look with doubt for an eventual success. There is no question that the old distribution plans could not be charged with a theoretical accuracy, as it is obvious there has been a fair amount of unnecessary cross country journeyings of coal, though in cases it is a question of quality serving an overall economy. Some coal for Ireland contracted for from Yorkshire,

Derbyshire, and North Staffordshire has been diverted to London, though after specific amounts have been so diverted, the owners in the districts named may then supply their Irish customers, who, failing sufficiency from those areas, must fill their requirements from other sources nearer the coast. Other fields are beginning to have their supplies redirected. Meantime the extreme northern coal areas are suffering from want of boats. The pits there, from all accounts, could supply much more coal if they could get it away. Railways cannot afford sufficient help to ease the situation; and this shows that conveyance is the weakness, and that it rules the whole situation. This is where a Coal Controller who is expert in railway matters is a decided advantage. Other areas such as Yorkshire and Nottinghamshire are working at high pressure. Those gas undertakings with their own boats who can draw coal from Durham are to be congratulated. There are concerns round the south coast whose contractors tell them there is plenty of coal to beh ad, but no additional boats. They are to be pitied; for every week and every day is important now in accumulating stocks for next winter.

Profitable Oil.

Not long ago, a note was made of some of the substantial dividends being paid by colliery companies; now we have brought within sight, but not tangibly, certain dividends paid by oil companies. Towards these the benevolent gas industry subscribes, while it sits with its own lean dividends reflecting on the hideous travesty of justice that in these hard times allows trading uncontrolled monopolies (the coal business until the Coal Controller came on the scene has been indifferently controlled) to suck so much profit from excessively pressed statutorily regulated ones. The Royal Dutch Company (which to all intents and purposes has been amalgamated with the Shell Transport and Trading Company), it is announced, paid dividends of 48 p.c. for 1913 and 49 p.ct. for 1914 and 1915; but for 1916 they have come down to 38 p.ct. It is stated that there is a little disappointment on the part of some poor souls over this deprivation of a little bit of their fat. But there is no room for commiseration when it is learned that the amount distributed is actually just about the same as for 1915, because a year ago the capital was increased by 33 p.ct., by shareholders subscribing at par for one new share for every three held. A very handsome bonus this! The Shell Company's shareholders are in for a similar piece of luck. A final dividend of 5s., or 25 p.ct., making 35 p.ct. for 1916, is to be paid, which was the rate for the preceding three years. Instead, however, of taking the 5s. dividend per share, the shareholders may at their option have for every four shares held one new share. As the quotation at the time of writing is over £6 per share, the profit is above £5 for every share taken under this arrangement. Who among the shareholders will reject such consideration? At the end of 1914 and 1915, the Shell and Dutch Companies had reserves of £4,000,000 and £4,450,000 respectively. The Burmah Oil Company have raised their dividend from 27½ p.ct. to 30 p.ct., and considerable sums are being transferred to depreciation and reserve. A few weeks hence we shall be seeing some dividends on ordinary gas stock only faintly representative of what was formerly paid, and then those dividends were moderate for a trading business subject to keen competition.

Bye-Product Coking.—We have received from Messrs. Benn Bros., Ltd., of No. 8, Bouverie Street, E.C., a copy of "Bye-Product Coking," by the late Mr. G. Stanley Cooper, B.Sc. (Hons. Lond.), F.C.S., M.I.Min.E., &c. Pending the fuller notice of the book, which will be appearing in an early issue of the "JOURNAL," it may be stated that the aim with which the author undertook the work was to provide a suitable text-book on the subject of the carbonization of coal in bye-product ovens, and to put into the hands of all interested an up-to-date and accurate account of the industry as it stands at present. Unhappily, the author died leaving the concluding chapter unwritten; and this was undertaken by Mr. C. P. Finn, B.Sc. The book costs 7s. 6d. net.

Redistribution of Coal Available for Steam-Boiler Purposes.—The Controller of Coal Mines recently circulated a large number of forms asking for information regarding coal used by steam-boiler owners throughout the country. Many of these have not yet been returned, and firms who have received such forms are therefore requested to at once forward to the Controller the particulars asked for. Otherwise it may not be possible for their requirements to receive consideration in connection with a scheme which is being prepared to enable a suitable supply to be maintained for all concerned. Any firms or persons using coal for land boilers who have not received a copy of the form should apply to the Controller of Coal Mines, Box D.S.R., No. 8, Richmond Terrace, Whitehall, S.W. 1.

CITY AND GUILDS EXAMINATION PASSES.

As was the case a year ago, Mr. L. G. Killby, of the Department of Technology of the City and Guilds of London Institute, has intimated that it will not be possible on this occasion to supply for publication a complete pass-list of the "Gas Engineering," "Gas Supply," and "Gas-Fitting" examinations. He points out that the results are communicated through the local secretaries at centres of examination to all candidates; and although corresponding lists with the names of candidates have in more normal times been supplied to the "JOURNAL," the reduced staff of the Institute will not be able to continue the practice at the present period of emergency. Later on, the names of the prize-winners will be available.

In these circumstances, it is necessary again to appeal to readers to afford that assistance with which alone will it be possible to compile a statement of successful candidates for publication. If secretaries and managers of gas undertakings, teachers, and pupils themselves will send on the names of all those whom they know to have been successful in passing any of the three examinations, these shall be included in the list which will appear in the earliest available issue of the "JOURNAL." Already several names have been forwarded; but these are being held over until more come to hand.

LIQUIDATION OF THE IMPERIAL CONTINENTAL GAS ASSOCIATION'S GERMAN WORKS.

THE German Chancellor, having ordered the liquidation of the Imperial Continental Gas Association, with the object of selling the undertaking—so far as its German interests are concerned—we learn from a notice in the "Journal für Gasbeleuchtung" of the 19th ult. that the Liquidator (Herr Max Cassirer, of Charlottenburg) invited tenders for the profits realized by the works up to the 15th of May. Prospective tenderers were to be furnished with details of the conditions of the sale, and would be allowed to inspect the agreements under which the business has been carried on and the valuations of the works. The sale, it appears, would be subject to an undeclared reserve being exceeded by the highest bidder. The notice does not make it quite clear whether the tenders were to be for the interests of the Association throughout Germany or only for its Berlin works.

In a message sent from Amsterdam on Saturday, Reuter's correspondent says: The dispute about the acquisition of the English Gas-Works in Berlin, which arose between Berlin, its suburbs (Wilmersdorf and Schoenberg), and some rural districts on the one hand, and the rural districts of Teltow and Nieder Barnim on the other hand, is as yet undecided. The "Lokalanzeiger," which inquired of the authorities concerned regarding the matter, was informed that this English enterprise was one of the most important hostages of English capital in the hands of Germany. It was added that, while it was naturally not the intention of the Government to get the highest possible bid, on the other hand the Government did not consider it advantageous to sell the property below its value. German capital, it was pointed out, was invested in Great Britain to a greater extent than British capital in Germany; and the Government, therefore, would prejudice German interests in Great Britain by allowing an unreasonably cheap sale. From Great Britain no complaints had been received of improper treatment of any German property; and, therefore, the German Government were endeavouring to exercise similar correctness. It was further stated that no decision had as yet been come to, as estimates from other quarters put a higher value on the property than the price offered by the two groups of bidders.

PERSONAL.

Mr. D. J. BRANSON, of Kettering, has been appointed temporary Junior Assistant at the Halifax Corporation Gas-Works for twelve months.

The distinction of being made a "Chevalier de la Légion d'honneur" has been conferred on M. le Capitaine LOUIS CROS, the Manager of the Boulogne-sur-Mer works of the European Gas Company, Limited, "for technical skill and distinguished service in the field."

The Military Medal has been awarded to Private G. A. T. Ross, of the Highland Light Infantry, for conspicuous gallantry during a bombing raid in France. Prior to joining the Colours, Private Ross was with the Glasgow Branch of Messrs. Falk, Stadelmann, & Co., Ltd.; and is the second member of the staff to secure this distinction.

The staff and employees of the Sutherland Meter Company, Ltd., last Tuesday, made a presentation of a marble clock and a case of pipes to Mr. L. HUGHES (the Assistant Manager), on his leaving to take up a position with Mr. George Wilson, of Coventry. The presentation was entrusted to Mr. H. S. Munnings (the Chief

Representative), who, on behalf of the whole of the employees, wished Mr. Hughes every success in his new sphere.

OBITUARY.

News of the death of Lieutenant P. Tew will be received with wide-spread regret. He was killed last Saturday week through an accident to an aeroplane he was piloting at the Cirencester aerodrome. He received his Commission in the Royal Flying Corps some months ago, and since passing his tests had been acting as instructor in various parts of the country. Before joining the Royal Flying Corps, he enlisted in a Public Schools Battalion of the Royal Fusiliers, where his mechanical skill attracted attention, and he was made armourer. He served in France with this regiment, and returned to England on getting a Commission. Lieutenant Tew was a son of the late Mr. W. T. Tew, the Manager to the Warwick Gas Company, and in civil life he was among the most promising of the younger members of the gas engineering profession. He received his training under Mr. Thomas Berridge, of Leamington, afterwards becoming Assistant Engineer at Felixstowe. Just before joining the army, he was appointed an Assistant to Mr. Hubert Pooley, of Leicester. All he undertook, Lieutenant Tew performed with boundless enthusiasm and untiring effort; and he will be greatly missed by the many friends he made wherever he went.

ELECTRICITY SUPPLY MEMORANDA.

In order to make a point, "Meteor" of the "Electrical Times" runs foul of conditions and facts. With a view to saving coal, the French Government have seen fit to make certain regulations under the special circumstances that the best of their coal areas are in German hands, that the cost of imported coal *plus* freight and expenses of delivery from port to place of consumption comes to a frightful amount, and that, owing to the shortage of tonnage, there is a deficiency of coal. Among other measures by which coal economy is sought, the Government have prohibited the use of gas during certain hours. There is nothing alarming about this; and we rather think in the circumstances it must be a matter of satisfaction to the gas suppliers. Another thing is that the Government instruct electrical engineers "to *endeavour* to find means of substituting electrical energy for steam-engines in factories." Again, just so, seeing that the steam-engines also use solid fuel. "Meteor" fancies there is in this a recognition by the French Government of the need for suppressing gas and promoting the use of electricity for economy's sake. Of course, our journalistic contemporary does not trouble to inform himself as to why the French Government can afford to take these lines at such a time as the present. He is not aware that a large bulk of the materials with which high explosives are made are being supplied to France from the gas-works and coke-oven plants of this country; and probably he has not stopped to inquire as to the running of the electricity stations of France by feeding the boilers with gas coke, supplemented in some places by wood. Circumstances alter cases. The French Government would write-down our own Government as arrant fools were they to follow their example; and they would have visions of an early termination of the war—to the disadvantage of the Allies. We laugh this time at "Meteor."

And We "Sniggered."

A year or more ago, our friend tells his readers, when Mr. J. Horace Bowden "countered the Board of Trade's [10p.ct.] coal-economy circular with a seeming paradox, the gas people sniggered." We not only sniggered, we laughed outright; and we made some comments. These appeared on June 6 last year; our interest in the matter being that Mr. Bowden appeared "to be labouring under the impression that national interests would be served if the lighting of the country was turned over to electricity, and gas was completely snuffed out." Our comments went on to show that we only used a small proportion of the substance of a ton of coal in making gas for light, heat, and power; and that we produced (say) ⅓ ton of coke for sale, and numerous other things of immense value to the country in war, in industry, and in agriculture. Mr. Bowden wrote a long letter which appeared on June 27 last year. A footnote to the letter asked him, as we had afforded him space for giving vent to a big stream of postulation, to address himself seriatim to our comments and questions of June 6. He did not do so. Perhaps "Meteor" will fill the void. If he has not space in the "Electrical Times" owing to the shortage and expense of paper, we will accommodate him in our own pages, because it does one good to have even something to "snigger" about in these times. Meanwhile, there has been no news as to the Board of Trade having adopted Mr. Bowden's plan for economizing coal. Perhaps they, too, "sniggered" over it in company with the Ministry of Munitions and the Board of Agriculture. Just recently, Lord Moulton, the Director-General of Explosives Supplies for the Ministry of Munitions, remarked: "Without the direct aid of the gas industry—and, further than that, the assistance and the knowledge which has been acquired by those who devote their lives to it—it would have been perfectly impossible for this country to have waged the campaign of the last three years, or even for any but a trifling time to resist the overwhelming flood of enemies poured upon it. . . . The response has been so splendid that we have become, I might almost say, affluent where I expected nothing but pauperism; and gradually we have seen ourselves creeping up to an equality with the supplies that our enemies have been piling up year after year in anticipation of a war that they intended to bring upon us, until now I think our anxiety in this department, which at first was probably the keenest anxiety of all, has passed away through your assistance." Will "Meteor" look upon this picture, and then compare it with his own production "How to Economize Coal," and the one by Mr. Bowden of a year or so ago?

An Unaccepted Invitation and an Appreciation.

Boiler Furnace Firing and Indecision.

The "Electrician" has devoted nearly the whole of the technical part of one of its issues to the question of coke and gas firing for the raising of steam for electricity generation. Electrical engineers are looking in several directions for economy—in these among others. They are convinced that the use for steam raising of bituminous coal must sooner or later come to an end. But they are undecided whether they should themselves put down huge coal-carbonizing plants, produce their own gas and coke, and go in for the recovery of secondary products, or whether they should enter into business relations with the gas and coke-oven industries for the supply of fuel. The fact of the matter is it is new and unexplored land to them. Some of the articles in our contemporary supply the proof of the confusion that exists in the minds of men who are considering a matter of which their knowledge only extends to the borderland. It would be a great pity if the electricity industry blindly pursued the notion of large plant concentrations, and high-pressure transmission about the country, without considering whether there are not other means, and less ambitious ones, of attaining equal economy and other advantages, taking the whole balance-sheet into account. The "Electrician" itself has a decided leaning towards centralization of generation, but, taking the articles generally, the writers do not consider the question of coke and gas firing from that point of view. As a matter of fact, practically the whole tendency is the other way. In view of these considerations, the industry distinctly requires light and leading from men who can give information without prejudice. Mr. E. W. L. Nicol might, as the expert to the London Coke Sales Committee, be regarded as being biased; but the article [see *ante*, p. 576] which he contributed to our contemporary among the others shows that he is not going to say anything more for coke than he can prove to be true under the conditions of its use. This is just as the gas industry would have it be; it does not want to gain ground under false pretences. The very physical condition of coke suggests that it requires different treatment from bituminous coal as boiler furnace fuel, and that physical condition gives it certain advantages over coal which should be very beneficial for the purpose. We are afraid that some electrical engineers who have tried coke, and have found it wanting, have not given to it the conditions for doing its best that are essential, because Mr. Nicol can oppose to their findings several concerns that are using this material without the drawbacks that are recounted by some of the writers. At the same time, he considers that, to gain full advantage from coke, more investigation into conditions of use would be profitable. This is seen in the remark: "The use of coke as fuel for steam-raising, and the consequent necessary changes in steam-boiler design, rating, and firing methods, will provide new engineering problems of the most interesting and immediately practical character."

A Fascinating Scheme.

But with the view to prospective development, the most fascinating part of Mr. Nicol's article is the scheme which has taken hold of his mind for supplying incandescent coke direct from retorts to boiler-furnaces, and to which he is seeking to give some definite shape for consideration. He recently referred to this in the "Journal." His suggestion is that by the use of the sensible heat now wasted by the quenching of coke from horizontal gas retorts, and for the matter of that from intermittently charged verticals (the pre-cooling and less dense character of the coke from continuous verticals bar its use), as well as the combustion heat of the coke, in a suitably constructed furnace for the raising of steam, a considerable saving of fuel would be effected, in addition to economy in transport and in various other directions. That is to say, with steam-boiler and generating plant in juxtaposition with the gas-retorts, it should be possible to effect appreciable fuel economies. These could be supplemented by the practice in some gas-works in America of utilizing the waste heat of water-gas plant and of retort-settings for steam-raising, or, at any rate, for preheating the feed water to boilers. There is room here for a happy combination of the two industries. As a matter of fact, we do not see the slightest reason why, if it is considered that the idea is impracticable for the electricity supply industry, gas-works themselves should not in this manner provide their own steam requirements, including the generation of electricity, if this can be done cheaper than by economically provided mixed gas used in gas-engines upon the production of which mixed gas the eyes of the industry are now set.

The possibilities for development and new practices are considerable. However, the suggestion will show the electricity industry that economy is not confined to any single line of utilizing the fuel supplies of gas-works. The "Electrician," in an editorial article, does not overlook the low-temperature system of carbonization, which it describes as a "much newer one" than that practised by the gas industry. We cannot expect the knowledge of our electrical technical friends to compass the whole history and operations of the gas industry. Far from being a "newer" process, low-temperature carbonization is the one with which the gas industry started its career. We have before stated the *pros* and *cons* of the case for low-temperature carbonization; but more than once there has been evidence that electricians are not particularly well versed in them. There is one thing that electricians should guard themselves against, and that is accepting all that those who are trying to make money out of low-temperature carbonization choose to say as to the wonderful things that are to be obtained from it. There are two sides to the question; there are competing low-temperature plants on the market; and it does not do to settle technical procedure either on generalizations or partisan assertion. Definite proof must be obtained both in regard to technical outcome and market prospects for the products.

Objections to Coke.

In an article by Mr. George Wilkinson, of Harrogate, he says that sufficient coke is not available for the purpose of steam-raising, that the increased demand would soon put up the price to a prohibitive figure, and that coke cannot produce more than one-half the steam from a given boiler plant as compared with good coal. As to the first objection, the gas industry produces not far short of 9 million tons of coke a year, after providing for its own fuel requirements for retort-heating. The electricity supply industry (recent electrical computations inform us) uses about 4 million tons of coal a year! Before the war the gas industry was not selling all its coke; and if (as we think is the case) gas heating is going to have considerable development, more coke still will be available for sale. We do not see any reason why a sliding-scale of price for coke should not be arranged, having some relation to the price of coal delivered to the gas-works, or based on its calorific value. But meanwhile the war has produced a large custom for coke at contract rates among private owners of steam plant and water-heating appliances, which is all to the future good in the marketing of the commodity. As to the point regarding efficiency, Mr. W. B. Woodhouse, of the Yorkshire Power Company, in a contribution that he has made, states that, while coke-firing can be carried on successfully, it is not highly efficient. But, on the other hand, we have Mr. Nicol, with his large daily experience, pointing out that, compared with bituminous coal of equal calorific value, coke (which is relatively uniform in character and composition, and requires a minimum excess of air, and no secondary air supply in order to complete its combustion) has a higher net evaporative duty. Look at the table at the end of his article; and there will be seen a higher percentage plant efficiency both for coke and breeze than for coal, a greater evaporation per pound of coke over coal, and lower fuel costs per 1000 gallons of water evaporated. Mr. J. A. Crowther, of Wallasey, is not by far enamoured of coke firing; but he admits that the amount of water evaporated with a Babcock and Wilcox boiler has averaged over a considerable period 6·75 lbs. per pound of coke; the temperature of the feed water being 85° Fahr.; and with a clean boiler 8·5 lbs. was recorded on a short test. In another article, an efficiency of 75·1 p.ct. on a boiler without superheater and economizer is spoken of. In still another instance the same efficiency of 75·1 p.ct. is to be seen, with an evaporation per pound of fuel (actual) amounting to 6·47 lbs., with the feed water at 48° Fahr. But Mr. Woodhouse, who states that coke firing is not highly efficient, prior to that accuses coal-fired boilers of not having a working efficiency exceeding 60 p.ct., which is much below the efficiencies declared by special test conditions. Information as to coke-firing efficiencies is plentiful in the articles; and so are particulars as to mechanically operated furnaces, fitted with forced draught, for coke. Then we have Mr. Crowther saying that he finds with coke the effect upon the arch, side walls, and the bridge or back wall are very severe. He puts this down to intense local heating and the gritty nature of the coke. On the other hand, Mr. Nicol speaks of ignition arches that have lasted for fourteen months; and he adds: "A contributory beneficial effect to this very satisfactory performance of both mechanical stokers and brickwork is no doubt the prior elimination, in the process of carbonization, of the volatile sulphur, which is one of the destructive elements in all natural coal fuels." Mr. Crowther admits *per contra* that with coke there is no deleterious action on the plates of Lancashire or the tubes of water-tube boilers—some tubes in the latter type having been in use seventeen years without renewal. The low ash content of the coke saves labour and clinkering and removal expenses; and the clean plates and tubes also promote efficiency. The point is also made that the storage of coke takes up more room than coal. The place for its storage is at the local gas-works; and what this means in railway or sea conveyance and storage for electricity concerns is a matter that is not hidden from view.

Gas-Firing of Boilers.

Among some electrical engineers there is a fancy for gas-firing. Mr. Woodhouse is one of them. Gas-firing, it is pointed out, saves capital expenditure; the quality of the gas being approximately constant, working variables are reduced; and the conditions are easily controllable—volume, pressure, and temperature of the gas and air. The high efficiency that has been obtained with the Bonecourt boiler is well known. It is easy to see how gas-firing will promote boiler efficiency, given the attention necessary to produce perfect combustion. But it is not all electricity works that are near coke-oven plants or blast-furnaces. Producer plants may be adopted; but some of these, like blast-furnace gas, have given only poor results. If producer plants are installed, the most economical procedure is to go in for an ammonia recovery system. In this connection, we have learned references to "hypothetical" flame temperatures; and we confess a not very intimate acquaintance with the "hypothetical" variety. Flame temperature is also controllable, we are told, within certain limits in the manner adopted by Prof. Bone, or by the preheating of the gas and air of combustion. Nothing is said as to the dragging influence on flame temperature of the large percentage of inert constituents in producer gas. Mr. George Wilkinson is also in favour of gas-firing; but the gas industry cannot at present supply the electricity industry with gas for such a purpose at a price to compete with coal. He thinks there is a field here for the development of a gas-producing plant with bye-product recovery. The gas industry is now shaping its course for a larger power-gas business; but, meanwhile, for steam-raising coke is finding a good market. However, in other articles, we read of—firing with Mond gas—a heat efficiency as between the calorific value of the gas and the heat in the steam generated of 79·1 p.ct. We read, too, of boiler efficiencies—these given by Mr. Woodhouse—with coke-oven gas, of 82·2 p.ct. minimum, 83·4 p.ct. maximum, and 82·5 p.ct. average, which figures indicate how, with gas-firing, great regularity can be achieved. Taking the articles as a whole, they show that, although electricity is only now on the border of fuel reform, it is a subject that has got a good hold; and we may yet be seeing the gas industry—not only in war time, but permanently, a large fuel supplier to its chief competitor.

NATIONAL PHYSICAL LABORATORY.

Report for the Year 1916-17.

OWING to the war, the usual large gathering at Teddington to meet the General Board and to inspect the National Physical Laboratory, on the occasion of the annual meeting of the Board, was this year dispensed with; only a few visitors specially connected with the work of the laboratory being present at the inspection, which took place last Tuesday. The report which was then submitted showed that during the past year the laboratory has been closely engaged upon a variety of researches and investigations arising out of the war, and has dealt with a greatly increased volume of test work for Government Departments. In fact, the outstanding feature of the year has been the growth of the gauge testing work. The investigations carried out have been in the main of a confidential character; so that details are not given in the report. In the matter of the researches undertaken prior to the war, it has been possible to make progress in only very few cases. Close attention has been given to the question of the relationship of the laboratory with the Department of Scientific and Industrial Research; and it is hoped a scheme may be arranged for closer connection with the department.

In the Heat Division, the laboratory standards for dealing with high-temperature tests of pyrometers have been greatly improved and extended. Two optical pyrometers of the polarizing type have been obtained and calibrated to 1600° C. by comparison with standard thermocouples. Valuable work has also been done in the improvement of furnaces for work at high temperatures. For work up to the figure just named, it is proposed to employ a gas-fired furnace, with a refractory lining of carborundum. In connection with the routine test work on Féry pyrometers, experiments have been made with the object of expediting the work by the use of screens to cut down the intensity, so that series of "apparent" temperatures may be obtained with a constant furnace temperature. Recently much consideration has been devoted to the question of refractory materials and their testing; the laboratory having been frequently requested to investigate the softening-point under load of refractory bricks. To carry out tests of this kind expeditiously, a special type of carbon tube furnace has been constructed capable of withstanding temperatures exceeding 2000° C.; and the temperatures are measured by means of the polarizing type of optical pyrometer. "Although," says the report, "the question of the refractoriness of materials used at high temperatures is a vital one, it is now being recognized in the industries that other properties—such as the coefficient of expansion or contraction, the disintegration under the influence of sudden changes in temperature, the thermal conductivity, and the resistance to abrasion—are also of prime importance." Methods of testing these physical properties are being developed; and, time permitting this year, it is proposed to investigate the thermo-physical properties of some typical British refractories.

The work done in the Engineering Department included a considerable number of tests of the fatigue resistance of materials under combined stresses. The Reynolds theory of the transmission of heat from surfaces to fluids flowing over them has been investigated for artificially roughened surfaces, and so far as the experiments have proceeded appears to be in accordance with the

observations. This theory is that the heat transmitted from a hot surface to a fluid flowing over it for a given velocity of flow and difference of temperature is proportional to the frictional resistance between the fluid and the surface. Previous investigations had already fully demonstrated the truth of this theory for the cases of commercially smooth surfaces.

In another direction, in connection with an investigation of the causes of failure of some compressed gas cylinders, a special fatigue test has been devised by means of which the pressure inside a cylinder is caused to alternate between fixed limits. In the cases tested, the pressure ranged from 200 to 400 lbs. per square inch; and it was found that failure ultimately took place by the development of cracks in the joints which would withstand a single application of a load many times the value named.

The income for the year was £70,896, or an increase of £19,524 over that for 1915-16. The expenditure rose from £49,803 in 1915-16 to £67,094 in the past year.

MECHANICAL HANDLING OF MATERIAL.*

IT is not a very long time since there was reviewed in the pages of the "JOURNAL" a treatise by Mr. G. F. Zimmer, Assoc.M.Inst. C.E., on the subject of the "Mechanical Handling and Storing of Material;" and now we have received a copy of another book by the same author, on this occasion dealing with the "Mechanical Handling of Material and its National Importance during and after the War."

This later book consists of a series of articles reprinted from "Cassier's Engineering Monthly," with about 150 illustrations, including a number of excellent collotype plates. Though, of course, on an altogether smaller scale than its predecessor, the name of the author, and what he has already accomplished, are sufficient guarantee that the contents of the book will be found of interest. Three of the collotype plates illustrate installations in gas-works. One of them is of a telpher installation at Exeter, another of tray conveyors of the horizontal and tipping tray type at Beckton, and the third of gravity bucket conveyors handling and distributing coke at Provan (Glasgow). The remainder depict representative labour-saving devices employed in various industries. The chapter referring directly to the handling of material in gas-works also embraces illustrations of several different forms of coal-handling plant, a coke-loading plant with Zimmer screen at Leeds, and a pan-ash washing plant as erected at Brentford and elsewhere.

Other chapters likely to be of particular interest to gas engineers deal with the storing of coal, mono-rails, telphers, mechanical or automatic stokers, and various conveyors and elevators and their suitability for different uses. In fact, Mr. Zimmer in his concluding remarks points out that the 130 pages of which the book consists contain the most important of the known and approved devices for saving, or aiding, labour in handling material, though there are many other machines and systems which he feels might with advantage have been included. The author foresees enormous business possibilities for this country after the war; and the justification for bringing forward the question of labour-saving devices in this connection is his argument that the country which can most cheapen the process of production stands the best chance of winning the markets, and the mechanical handling of material is one of the chief aids to cheap production. Many people will be surprised at the numerous kinds of, and the variety of purposes served by, plant described and illustrated in the book.

* "Mechanical Handling of Material and its National Importance during and after the War." By G. F. Zimmer, Assoc.M.Inst.C.E. London: Crosby Lockwood & Son; 1917. Price, 10s. 6d. net.

THE WRECKED HOLDERS AT ASHTON-UNDER-LYNE.

DETAILS of the terribly destructive explosion that took place at a chemical works at Ashton-under-Lyne on Wednesday, June 13, were published in last week's "JOURNAL." Among other property that fell victims to the force of the explosive wave were, as then stated, two gasholders belonging to the Ashton Gas Company, and two holders, as well as other parts of the gas-works, at Dukinfield. To-day, through the courtesy and assistance of friends, we are able to reproduce some photographs of the wrecked holders at Ashton; and these will be scrutinized with the greatest interest by the engineering colleagues of Mr. Joseph Townsley, the Engineer, upon whom falls the heavy responsibility of relieving his Company (as is the case with Mr. William Lindley at Dukinfield) as early as possible from the crippled condition into which his equipment was suddenly thrown by the deprivation of the service of the two holders. Examining the photographs, it will also be remarked that the contractors for the restoration of the vessels have an unusually ugly and critical piece of work to tackle. Some particulars from a technical correspondent [p. 586, col. 2] as to the damage appeared last week; and the photographs appearing on the opposite page of to-day's number illustrate and emphasize that account.

A correspondent writes as follows regarding the newspaper statements as to the holders exploding:

> I feel convinced that the shells of the gasholders here were split owing to the force of the concussion caused by the explosion, and the gas evidently fired, for the paint has not only been scorched, but carbonized over large areas, showing long contact with heat. The observable fractures are not in the form one would expect had an "explosion" taken place inside, being more in the form of a tear than a burst. There may have been other explosions; but these cannot be attributed to anything that occurred at the gas storage station. Portions of the chemical plant were blown right through the gasholders; and had it not been for the protection afforded by these structures, the row of cottages behind would probably have been razed to the ground. Further, had the gasholders exploded, their framework would have fallen outwards, and added injury to the adjoining property. I found, however, that the framework on the side nearest the explosion had been blown into the tank, and now is underneath the holder; whereas the surrounding framework on the side farthest away is still intact. The management took prompt measures to deal with the difficulty; for directly the damaged shells grounded and the 1½ million cubic feet of gas had burned away, the valves were closed—thus preventing any mixture of gas and air accumulating in the wrecked vessels, which would probably have caused an explosion.

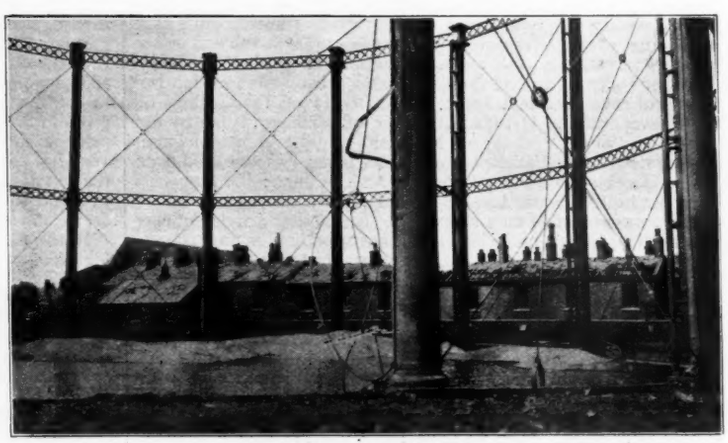

Fig. 1—No. 1 GASHOLDER.

[The explosion was directly opposite the centre, which is the left-hand corner of the picture. The inner lift of the holder was inflated; and the property behind would have suffered considerably more had it not been for the holder.]

Calorific Standard Orders.—The Board of Trade have made Orders under the Calorific Standard Act for the Harrow and Stanmore Gas Company, the Ilford Gas Company, the Newport (Mon.) Gas Company, and the Normanton Gas Company.

WOMEN IN GAS OFFICES.

[COMMUNICATED.]

THE ex-President of the Institution of Gas Engineers (Mr. A. E. Broadberry) has told us what excellent work women are doing in gas-works—even such hard work as loading coke, the turning of oxide, the painting of gasholders, and the driving of engines; and the General Manager of the Glasgow Tramways (Mr. James Dalrymple), who has earned much notoriety of late in connection with his Tramway Lottery Scheme, observed recently that he had been so pleased with the way in which women had discharged their duties as conductors, &c., that he would have no hesitation in "manning" all the service with women. Someone suggested it was probably only modesty which kept him from proposing that his own position might be taken by a lady!

Women are doing good work in gas offices. Formerly, the province of the fair sex in the office departments of gas undertakings was limited to the typing-room, and, in some cases, to the showroom. Now, in addition, they are keeping rental ledgers, making-out gas bills, entering-up and posting cash-books, receiving money at the counter, attending to postal remittances, and working side by side with male ineligibles and "indispensables" in a thoroughly efficient way. And if they have not been employed to any great extent as outdoor collectors, the reason is to be found—not in their unsuitability, but in the fact that the large majority of men so employed are above the military age. Women, in the writer's experience, have proved themselves to be hard-working, and quick at taking-up new duties; and if at first

Fig. 2—No. 2 GASHOLDER.

Fig. 3—VIEW ACROSS PART OF No. 1 HOLDER LOOKING TO THE FRAMEWORK OF No. 2 HOLDER.

[It will be observed from figs. 1 and 3 that the framework of the holders away from the explosion is intact.]

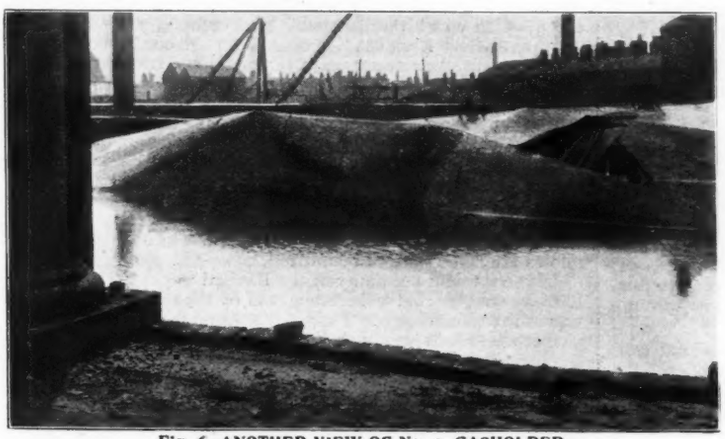

Fig. 6—ANOTHER VIEW OF No. 2. GASHOLDER.

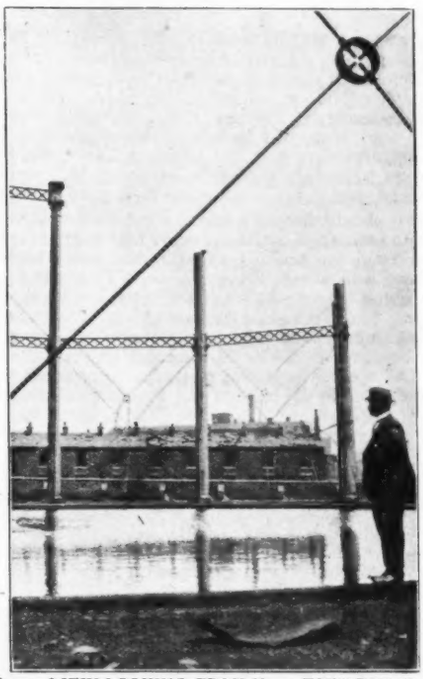

Fig. 4—VIEW LOOKING FROM No. 2 TOWARDS No. HOLDER.

[The plate in the foreground is part of a still, from the seat of the explosion.]

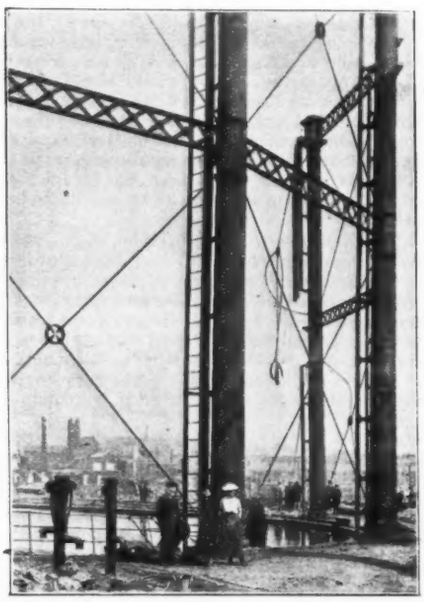

Fig. 5—VIEW BETWEEN THE COLUMNS OF No. 1 GASHOLDER.

[This shows the columns missing that were blown into the tank, and are underneath the gasholder.]

Fig. 7—VIEW SHOWING THREE DAMAGED COLUMNS ON No. 2 GASHOLDER.

they were not disposed to look upon their tasks with sufficient seriousness, showed an undeveloped sense of accuracy, and were inclined to gossip, these faults soon passed away or were greatly modified, under the influence and example of the sober-minded male seniors in the same room. A woman cannot, without injury to her nature, rid herself of the characteristics of her sex and temperament; and so it is natural she should bring to her official work a mind not entirely free from the little vanities and frivolities which find in the social circle their more fitting place.

It should also be borne in mind that most of the women taken into offices are between twenty and thirty years of age, and have not had the training and the discipline which fall to the lot of boys who usually have no—or only a short—interval between leaving school and "going to work." Many of them, too, have been allowed a great deal of liberty at home, and some have got into untidy and slap-dash ways, which, when brought into an office, arouse the ire of the chief, who is unfitted for his position if he is not a master of method. Allowances should be made for the home environment; the importance of order and accuracy should be firmly pointed out and insisted upon; and—as a last resort and as a general warning—all incorrigible muddlers and blunderers should receive a week's notice to quit. A bank manager recently complained to the writer that when he pointed out mistakes on the part of his lady assistants—errors in casting columns, postings of debits and credits to wrong accounts, and so on—all they did was to smile sweetly, and say, in a drawing-room tone, "Oh, I'm *so* sorry!" "What can you do?" he asked, pathetically. "Grin and bear it!" was the answer. "They will improve in time."

Have the women in gas offices come to stay? This is a difficult question to answer. As was pointed out in the "Co-Partnership Journal of the South Metropolitan Gas Company," a considerable number of female workers are married women, who will be only too glad to resume their home life as soon as their husbands are restored to them; some are engaged to be married "after the war;" while others may come to the sensible conclusion that, as man's natural complement, there is no place like home. But even after making full allowance for retirements due to these causes, there will still remain a large number of women who, having tasted freedom—independence is, perhaps, a better word—and found it sweet, will not care to go back to the dusting of ornaments, the darning of stockings, the peeling of potatoes, and the *ennui* engendered by the sameness of domestic duties. Their minds will have been stimulated; they will have become fond of business routine and methods, and of mixing with the other sex on more or less equal terms; and they will be loth to part with these things. Even the prospect of marriage in the hard times in store for all of us will likely have lost some of its attractions.

Few would be disposed to deny that a very large part of the work in gas offices is quite suitable for women. It is also true that many young men, having been physically braced by their soldiering, will prefer an open-air life to the confinement of desk-work; and many persons competent to judge foretell a great increase in emigration. It is, therefore, probable that many of the woman clerks who have proved themselves to be specially efficient will be retained. Some may marry, and thus cause vacancies, which could be filled by young girls straight from school. Expenses would thus be reduced; and there will be few undertakings which will not have, for many years to come, to keep a sharp eye on expenditure. There is no doubt many middle-aged clerks are doing work which could be as efficiently performed by young men or young women under twenty-five years of age; and these men's salaries have to be increased from time to time—not because their work is worth more, but because matrimony and children have made their pay inadequate.

Here we meet the sociological problem, which is one that cannot be ignored. The foundation of the State is the home and the family. If our young men, through women occupying their places in offices and elsewhere, are forced to leave the country, the present lop-sided state of the sexes, and the falling birth-rate, will be accentuated, and the Old Country may find itself less than a generation hence in so parlous a condition as to population as to cause it to rub its eyes and ask if the time has not really now come for something to be done to relieve parents of large families of some of the burdens under which they groan. Premiums may be offered for babies; and the fathers of young families may be exempted altogether from payment of income-tax. The question of economy ought not, therefore, to be the only one which right-minded employers should take into consideration when discussing the subject of women labour. After all, the office expenses of a gas undertaking do not amount to much per thousand cubic feet of gas sold; and it is extremely doubtful whether in the long-run women will be disposed to accept smaller wages than would be paid to men for the same work.

Austro-Hungarian Gas Association.—This year's general meeting of the Association of Gas and Water Engineers of Austria and Hungary was fixed for Saturday, the 9th inst.; the place of meeting being the House of the Hungarian Engineers' and Architects' Association at Buda Pest. A conference of managers of works was arranged to take place on the day previous to the general meeting of the Association.

NOTTINGHAM GAS-WORKS EXTENSIONS.

New Woodall-Duckham Plant.

The Nottingham Corporation Gas Committee have advanced by a further stage their far-reaching scheme of works reconstruction; the utilization of one-half of the new Woodall-Duckham plant installed at the principal municipal carbonizing station at Basford having been recently rendered possible, after manifold difficulties and delays experienced in regard to labour and materials. It is in pursuance of a policy which was inaugurated at the older depôt at Radford, nearer the centre of the city, that the extensions are being effected; and at a period when financial considerations reign supreme, it is interesting to note that the Committee are able to meet the outlay from resources which it has been part of their settled plan annually to augment. The building-up of reserves which were jealously safeguarded under the chairmanship of a former doyen of the Council, the late Alderman John Barber, has been substantially elaborated by the present head of the Committee, Alderman Albert Ball, to whose efforts, supplementing managerial resourcefulness, the city owes much in relation to its chief trading undertaking.

Expenditure upon the Radford works, where Glover-West verticals have been for some time in operation, was represented by £24,000 for forty-eight retorts, arranged in six beds of eight each; but the outlay at Basford, designed to afford means for a further carbonizing yield of over 4,000,000 c.ft. daily, is upon a much larger scale—approximating to £60,000. The Radford account has been met, as the new contract is being dealt with, from funds represented by a balance, according to the available figures up to March last, of £112,735 on the renewals account, to which £20,000 was added during the year, in which the total standing to the credit of the reserve and "rest" account was also raised to £212,381. The present extension, marking one of the most important of the stages in the continuous development of the undertaking since its acquisition by the Corporation in 1874, has been carried out with a minimum of dislocation of existing arrangements, and upon an area small in comparison with the potentialities of the plant.

From a gas engineering point of view, the work presents features representing a significant advance upon former undertakings in connection with the Woodall-Duckham patents; the special point of interest on the technical score being that the Basford retorts, in the matter of their capacity, are the largest which have as yet been constructed under this system. Each retort will carbonize 7 tons of coal daily—a notable advance upon the previous maximum of 5 tons—while in regard to labour-saving the result will be especially marked; it being estimated that two-thirds of the manual help hitherto employed here will be dispensed with when the new plant comes fully into operation. The contract, in the execution of which the Company are represented by Mr. A. M. Tarrant as their Resident Engineer, is for the construction of two benches of twelve settings, each set containing two retorts, or 48 in all, capable of producing 4,032,000 c.ft. of gas daily. If the new arrangement answers according to specifications, one man will be capable of controlling the carbonizing of half as much coal again as under any previously existing plan; the appliances rendering it possible for a single worker to manipulate 180 tons of coal per day. The site for the new plant has been secured by the partial demolition of an old house containing appliances of the horizontal type; the plans allowing, in the event of an extension of the system, for the remainder of the house into which the new retorts are being built to be utilized.

The convenient proximity of the Basford works to the Midland Railway enables coal to be brought in by the existing line on one side of the retort-house. Though the Nottingham Corporation go farther afield for some of their supplies, much of the coal which has been found suitable is from neighbouring collieries. From its point of arrival at the works' siding, adjacent to the new plant, the coal is conveyed by means of a rotary wagon-tipper into a receiving hopper; the tippler being adapted for dealing with wagons up to a 12-ton load. Beneath the receiving hopper a screen is provided, feeding the coal into a 100-ton per hour breaker; this, in turn, feeding the broken coal into a 100-ton per hour tray conveyor. The latter directs the coal into the retort-house, there to discharge it by means of rotary fillers into a 100-ton per hour gravity-bucket conveyor, one of which encircles each bench of settings. These gravity-bucket conveyors are responsible for elevating the coal to the level of the storage hoppers, into which it is discharged by means of a travelling two-way shoot. From the storage hoppers the coal is fed direct through the Woodall-Duckham special type of valve into the four-hours auxiliary supply hoppers attached to the top mouthpieces of the retorts; so that the contents of these auxiliary hoppers of coal fall by gravity into the retorts at a speed governed by the rate of extraction of the coke at the bottom.

Under the coke-extractors, hoppers are installed for receiving a four-hours' make of coke; the bottoms of these hoppers being closed by Woodall-Duckham patent water-sealed doors. The contents of the hoppers are discharged through rotary fillers on to the gravitating bucket conveyors, and elevated by them to the level of the overhead storage-hoppers. In turn, the coke required for feeding the producers is discharged by the gravity bucket conveyors through two-way shoots into the overhead storage hoppers placed above the producers. Thus by the scheme

the same conveyors are used to elevate the coal to the hoppers as elevate the coke. From the overhead storage hoppers, the coke is discharged direct through the shoot into the charging holes of the producers. The coke required for filling the retorts after scurfing, &c., is taken from these overhead storage hoppers, and fed by means of a suitable shoot into a skip suspended from a mono-rail placed underneath the storage hoppers, along which the skip travels.

In dealing with the rest of the coke, the gravity-bucket conveyors discharge it at the level of the overhead storage hoppers on to a 50-ton per hour tray conveyor, which leads it across the yard to the coke-storage hoppers, which are of considerable capacity. Provision has been made for these storage hoppers being suitably carried above ground in order that railway trucks may be filled on one side and carts on the other. They are fitted on the top with two coke-screens, affording a ready means of dividing the coke into sizes suitable for sale—a special compartment being provided for each side. Arrangements have been devised to obviate the inconvenience of any possible breakdown of the gravity-bucket conveyors; there being means of utilizing either of the conveyors. The coke and coal storage hoppers for the settings are of a capacity of 48 and 24 hours respectively. The work involves the erection of two chimneys of 130 ft. each. A new and interesting feature connected with the plant is the mechanically-operated grates for the producers, by which it is hoped to use a minimum amount of breeze and to obviate all labour in cleaning fires.

The coke-hoppers filled for sale are 60 ft. by 20 ft. and 16 ft. deep, divided into six compartments—two for breeze, two for small coke, and two for large coke. All the conveyors are electrically driven; three generating sets being installed to provide the necessary current.

In a notable paper which he contributed to the International Congress of Applied Chemistry in 1909, Prof. Witt declared: "It was not so very long ago that we began to have a conscience for fuel. We are now awake to the fact that the quantity of fuel required for an industrial process is very much dependent upon the way in which it is made to do its work." Therein lies the *raison d'être* of the Nottingham Gas Committee's latest venture. While obviously the scheme possesses its elements of particular local interest, the wider point of view presents the possibility of substantially valuable data accruing from experience of the largely amplified type of retorts now being brought into use.

EXPERIENCES IN THE DISTRIBUTION OF MIXED GASES AT LOS ANGELES, CAL.

By NORTON H. HUMPHRYS, Assoc.M.Inst.C.E., F.C.S., &c.

IN view of the discussions arising out of the recent suggestion issued under the authority of the Controller of Coal Mines, and the conflict of opinion as to the quality of gas that in the interests of all concerned it is best and most advantageous to supply, some experiences related to the Natural Gas Association of America by Mr. Alex. B. Macbeth, the Manager of the South California Gas Company, are of particular interest.

The district concerned includes a population of 750,000, of whom 190,000 are users of gas, which is a high showing, considering that it is little used for lighting; the chief lines being cooking, heat, and power. The maximum day's output is 36½ million cubic feet. From other details stated it would seem the annual consumption is in the neighbourhood of 600 millions—an average of some 35,000 c.ft. per consumer, and the unusually high figure of 8000 *per capita*, a condition that is not likely to have been attained without much energy and enterprise in the selling department, and is an object lesson to those who talk about the "limit being reached at 7000 c.ft. or so, as the climate is warm, the average temperature high, and these conditions are unfavourable to the use of gas as fuel." These details are here referred to as showing that the experiences are not on a small scale, but of such magnitude as to constitute fair evidence; and it is proposed to summarize the leading points in the paper, and offer some comment thereon.

QUALITIES OF THE GASES CONCERNED.

The extensive range covered by the composition of the gases concerned, as exhibited by the following details, is noticable:

	A.	B.	C.	D.
Calorific value, B.Th.U.	674	535	1120	1208
Ditto, calculated, "	659	481	1068	1132
Specific gravity	·549	·440	·720	·780
Ditto, calculated	·421	·415	·681	·731
Illuminating power, candles	18·5	—	—	8·4
Carbon dioxide, p.ct.	0·5	4·6	5 0	—
Nitrogen, "	3·1	1·6	0·7	—
Oxygen, "	0·2	0·7	—	0·4
C_mH_n, "	4·1	0·6	0·4	—
Carbon monoxide, "	8·1	13·6	—	—
Hydrogen, "	46·4	53·2	—	—
Methane, "	37·6	26·1	79·0	84·0
Ethane, "	—	—	14·9	15·6
	100·0	100·4	100·0	100·0

The calculated calorific values and specific gravities have been added for the purpose of comparison. In all cases, they are appreciably below the observed figures, indicating the presence of heavy hydrocarbon vapours, in addition to those absorbed and included in the analyses. This feature is peculiar to all kinds of illuminating gas, especially if carburetted by any secondary process. But the difference is greater in A than can thus be accounted for in respect to specific gravity, especially since that of the calorific value is slight. A larger discrepancy is the illuminating power credited to D—admittedly a rich gas that caused complaint of smoke and soot. The respective values of methane and ethane are 5 and 35 candles; and there would be some addition for traces of the heavier hydrocarbons. A mixture of 16 parts of ethane with 84 parts of methane represents 9·8 candles by calculation; and therefore one would expect this gas to be something well over 10 candles. Judging from the composition, A is a straight coal gas and B a stripped mixed gas; and the composition of D approximates to that of C with all the carbon dioxide removed.

EXPERIENCES IN THE DISTRICT.

Before 1913, when natural gas was introduced, the district was supplied with artificial gas. At first, C was used in quantity ranging from 15 to 45 p.ct., and was followed a year later by D. About equal quantities of C and D are available; and since that date a proportion of half-and-half natural and artificial gas has been adhered to as nearly as circumstances will permit. During emergencies, however, it has been necessary to reinforce the 50 p.ct. mixture with undiluted natural gas. When C was thus applied in 1914, the burners in the district had been adjusted to suit a 800 B.Th.U. mixture; and as long as the artificial gas was maintained at not less than 625 B.Th.U., comparatively few district complaints were received. But later, taking advantage of the advent of natural gas, the composition of the artificial gas was reduced to that indicated by B; and when less than 550 B.Th.U. was sent out, striking-back and lighting at the gas-nipples gave rise to much complaint. Reinforcement with C, in the winter of 1915-16, was not attended with serious trouble; but an attempt to utilize D in a similar manner in 1916-17 caused great complaint of smoking and sooting of utensils, or of poor supply. In this instance, the district was supplied with 1200 B.Th.U. gas for several hours in the day, and with anything down to 800 B.Th.U. during the remainder. The quality was subject to fluctuation to this extent during cooking hours.

TESTING-ROOM EXPERIENCES.

Particulars of extensive tests of calorific and photometric values of various mixtures of A and D are included, together with practical observations of the flames produced in cookers, fires, radiators, and incandescent mantles; but there is no reference to the pressures under which the experiments were conducted. The air inlets were all adjusted to suit a half-and-half mixture. The observed calorific values and specific gravities of the mixtures agreed closely with those arrived at by arithmetical calculation. A change of 20 to 30 p.ct. was necessary before any variation other than the size of the flames was observable, and good combustion was obtainable with all mixtures between undiluted A or D. With the lower qualities, the flames were blue and of smaller size; but there was no back-firing. With the higher qualities the flames were yellow and inclined to float; but by simply reducing the gas supply a fairly satisfactory result could be obtained. The incandescent burners could not, however, be satisfactorily adjusted to suit D; the mantles remaining good and white only at the base. The experiments were repeated, after the burners had been as far as possible adjusted to suit D, together with further tests as to the effects of sudden changes of quality, and of using 600, 540, and 513 B.Th.U. gases. With the exception of the few cases in which the gas outlet could not be sufficiently reduced, a good blue flame could be secured from D, and in these the efficiency improved as the quality was reduced. Down to 600 B.Th.U. the flames gave no trouble beyond diminution in size; but with 540 B.Th.U. there was frequent back-firing, especially in oven burners.

The results shown by the photometrical tests can only be explained by the assumption that flat-flame lighting burners do not possess the high degree of elasticity indicated in the above tests. No particulars as to the description of burners used, pressures, or other details are given; but it would seem that, when adjusted, half-way—say, for a ·600 or ·650 specific gravity—any marked departure in either direction is attended with rapid loss of efficiency, and of larger proportion with the richer than with the poorer gases. This could be met, to some extent, by reducing the pressure or rate of consumption to suit the specific gravity, which is probably a more important consideration than the actual chemical composition. Starting with 100 p.ct. A at 18½ candles, the effect of successive additions of 5 p.ct. D, up to 20 p.ct., was an increase of about ½ candle at each step; the quality remained fairly even at 21 candles or so, until 40 p.ct. was attained; and further additions up to 95 p.ct. were attended with a decrease of nearly 1 candle, until 13 candles was reached. It is remarkable that an admixture of only 5 p.ct. of natural gas gave an increase of more than 50 p.ct. in photometrical value. The candle-power of the natural gas and its richer proportions were difficult to determine, by reason of the streakiness and unsteadiness of the flame.

Mr. William C. Buckley, of Longsight, Manchester, a Director of the Leyland Gas Company, left estate of the gross value of £178,685, including personalty of the net value of £174,603.

A DISCUSSION ON FUEL ECONOMY.

Considerable time was devoted at the annual meeting last Thursday of the Incorporated Municipal Electrical Association to a discussion of the question of fuel economy.

Mr. J. A. ROBERTSON, the Borough Electrical Engineer of Salford, opened the debate, the early part of his contribution containing a good deal that is familiar to gas engineers, inasmuch as it gave figures which have already appeared in Prof. Bone's Royal Institution lectures. He went on to discuss the problem from the points of view of (*a*) centralizing the production of power, and (*b*) combining the carbonization of coal and bye-product recovery with the generation of electricity.

After dealing with the output, export, and other questions relating to coal, Mr. Robertson referred to the evidence given by Sir George Beilby before the Royal Commission on Coal Supplies in 1905, in which it was estimated by the witness that the consumption of coal in factories was 45 million tons per annum (or 24·4 p.ct. of the total consumption of the country). For domestic purposes, the consumption was 39 million tons (or 21·4 p.ct. of the total consumption of the country). In the same evidence Sir George estimated that 5 lbs. of coal were consumed in the factories of Great Britain for each I.H.P. hour produced.

The author thought it probable that this figure had been reduced in the meantime (by economies) to 4½ lbs. of fuel; but he pointed out that for the electrical undertakings furnishing returns for the 1907 Census of Production, the consumption of coal came out at 5·1 lbs. per unit, or 3·9 lbs. per electrical horse power hour. Since then, however, the central stations had enormously improved their position relatively to private power plants. For instance, in a census taken last year of four groups comprising 26 electrical undertakings in Lancashire and Cheshire, it was found that the consumption of coal varied from 2½ to 8 lbs. per unit sold; the average consumption of all these undertakings being 3·2 lbs., which figure is equal to 2·4 lbs. per H.P. hour, representing a reduction of 52 p.ct. compared with Sir George Beilby's estimate in 1905, and 37 p.ct. compared with the average consumption in central stations in 1907. On the yearly output of statutory electrical undertakings—*i.e.*, 2000 million units—the saving represents 1¾ million tons per annum.

Reckoning one-third of the total coal consumed in factories to be required for direct heating purposes, Mr. Robertson contended that the transference of the remaining two-thirds of the load to central stations under existing conditions, assuming sufficient plant was available, would effect a saving of not less than 15 million tons of coal per annum. Now, with a consumption of 3·2 lbs. per unit of fuel containing 12,500 B.Th.U. per pound, the thermal efficiency came out at only 8½ p.ct.; and he maintained that, under a centralized system of production, a continuous thermal efficiency of 18 p.ct. is well within the range of possibility.

The author then dealt in detail with a number of methods by which further economies might be produced. This led up to his submission of the point that it is possible to obtain an over-all efficiency of 18·8 p.ct. for energy delivered to the consumer. The coal consumed on this basis would amount to 1·45 lbs. per K.W. hour sold, or 1·09 lbs. per electrical H.P. If this could be achieved, it would mean a saving of 75 p.ct. of the fuel at present used in factories for power purposes, if the load was transferred to central stations operating under a national centralized scheme.

Mr. Robertson turned next to the consumption of fuel for domestic purposes, which, as already stated, amounts to 39 million tons per annum, and submitted that it was questionable whether the ratio of heat units actually utilized to the heat units contained in the coal is more than 5 p.ct.

Speaking of the enormous waste of heat involved in the coal-fire, he said that, allowing for the existing prejudice in favour of open-hearth fires, for which some form of smokeless fuel would probably be used in the near future, there was an enormous potential field for the employment of electricity for cooking purposes and also for heating bedrooms and other rooms required intermittently. The use of gas-fires and gas cooking-appliances was undoubtedly on the increase; and, though some might be inclined to disagree, it must be admitted that for convenience and cleanliness they possessed distinct advantages. On the other hand, the products of combustion must be got rid of at the expense of the heat in the fuel; and it was doubtful if the actual efficiency of gas-fires was more than 10 or 12 p.ct. Taking the same basis of comparison, the efficiency of electric radiators and cooking devices might be as high as 85 to 90 p.ct.; while for convenience and cleanliness they far surpassed the gas-fire or gas cooking-stove. The difficulties which formerly existed with regard to the design and construction of appliances had now been overcome, especially with regard to cooking. If energy could be sold at prices from ⅜d. to ½d. per unit (and with a centralized scheme of production, there was no reason why it should not), electric cooking would undoubtedly become universal, not only in hotels and better houses, but also in the homes of the working classes.

Here the author remarked that it was outside the scope of his paper to estimate the cost of the national centralized system of electricity production; but it appeared beyond question that the saving in fuel, amounting to not less than 30 million tons per annum for factories and domestic purposes alone, would be amply sufficient to meet the charges on the capital expended, and also to compensate existing interests which might be adversely affected. The linking-up proposals, he suggested, must be considered with relation to the larger scheme of centralization.

Dealing with the carbonization of coal, Mr. Robertson pointed to the waste—the loss of the valuable bye-products—involved in the direct burning of coal in boiler furnaces, hitherto, with few exceptions, the practice of electric supply station engineers. It was common knowledge that from a purely thermal efficiency point of view, the carbonization of coal in gas-works was a much more efficient process than the direct burning of coal in central power stations. The thermal efficiency of a gas-works might be as high as 65 or 70 p.ct., whereas the average thermal efficiency of central power stations was in the neighbourhood of 8 or 9 p.ct., although several large power stations were obtaining efficiencies of 12 or 15 p.ct. The following comparison illustrated his point:

THERMAL EFFICIENCY OF GAS-WORKS AND ELECTRICITY POWER STATIONS COMPARED.

ELECTRICITY WORKS.	GAS-WORKS.
One ton of coal (12,500 B.Th.U.) burned direct in boiler furnaces will produce, at 2½ lbs. consumption per Kelvin, 896 units of electricity. Thermal value = 2,965,000 B.Th.U.	One ton of coal (12,500 B.Th.U.) will produce 11,000 c.ft. of gas = 6,050,000 B.Th.U.; 9 cwt. of coke of 9500 B.Th.U. per lb. = 9,576,000 B.Th.U.; 10 gallons of tar = 1,550,000 B.Th.U. Total 17,176,000 B.Th.U.
Thermal efficiency, 11 p.ct.	Thermal efficiency, 64 p.ct.

Total heat in coal, 26,992,000 B.Th.U.

The advantages of electricity which led to its adoption in preference to gas were due to the higher efficiency obtained in its application for industrial and domestic purposes. It was claimed, therefore, that if the high thermal efficiency of coal carbonization could be combined with the efficient application of electricity, they would have an ideal method for the economical utilization of fuel.

There were one or two questions that required to be carefully considered before accepting such claims. The most important was the question of bye-products. There was no direct economy in carbonizing coal for the purpose of producing gas to be utilized for firing steam-boilers. The amount of coal consumed by such a process must always be greater than that required to produce an equivalent amount of heat by direct firing. The whole question turned on the value of the bye-products produced; and before any general scheme of coal carbonization was adopted, it would be necessary to ascertain if there was a permanent and remunerative market for these. If the cheap production of electricity would lead to its universal adoption, it would be a mistaken policy, for instance, to carbonize coal with the sole or primary object of producing a smokeless fuel for domestic purposes.

To obtain the highest possible efficiency in power production from the carbonization of coal involved the employment of internal combustion engines. The high thermal efficiency of gas-engines (about 27 p.ct.) had often attracted power engineers; but although enormous sums had been spent on their development in large sizes, they could hardly be claimed as a commercial success. Their higher capital cost, the increased labour and maintenance charges, and less reliability as compared with either steam-engines or steam-turbines, proved deciding factors against their general adoption. Even on the ground of efficiency, the steam-turbine in large sizes had almost overtaken the gas-engine; and it was doubtful if the best results obtained in practice with any type of gas-producer internal combustion engine plant equalled the results obtained in daily practice with steam-turbines and direct-fired boilers. In smaller sizes—say, up to 1500 H.P.—the gas-engine had still a limited field for employment, especially in connection with coke-oven installations, where the surplus gas was regarded as a bye-product, and where the demand for power was relatively small in proportion to the amount of coal to be carbonized for coke production. But for generation on the scale required in a centralized power scheme, they could be left out of account.

There were two systems, apart from the carbonization of coal in gas-works (where illuminating gas was the chief product), which might be considered. These were:

(*a*) Producers of the "Mond" type, in which coal or coke is burned to ash with or without production of bye-products.

(*b*) Coke-oven installations, which distil coal at a low temperature, producing metallurgical coke as the chief product, with a certain amount of surplus gas and other bye-products.

The "Mond" process produced gas at the rate of about 120,000 c.ft. per ton of coal carbonized, having a calorific value of 150 B.Th.U. per cubic foot. When employed for bye-product recovery, sulphate of ammonia was obtained equal to about 4 p.ct. of the weight of coal carbonized, and about 3 p.ct. by weight of a somewhat inferior tar. The thermal efficiency of a "Mond" producer might be taken at 65 p.ct. when employed solely for the production of gas. If employed with bye-product recovery, the efficiency was reduced owing to the larger amount of steam—about two-and-a-half times the weight of the coal carbonized—required for the furnace. It would be a fair estimate to assume the efficiency under these conditions as about 57 p ct.

Coming to the gas-firing of boilers, it was stated that considerable difference of opinion appeared to exist regarding the efficiency of gas-fired boilers—some authorities placing it as low as 75 p.ct., while others claim 85 or 90 p.ct. The lower efficiency was probably the result of tests made with boilers and furnaces originally designed for the direct burning of coal. Assuming an efficiency of 90 p.ct. for gas firing and 80 p.ct. for direct coal firing, the following results were obtained:

	Per Cent.
Efficiency of gas-fired producer with bye-product recovery	57
Efficiency of gas-fired boiler	90
Combined efficiency	51·3
Efficiency of direct-fired boiler.	80

In other words, for every 100 tons of coal consumed for direct firing 155 tons were required to produce the same amount of heat from producer gas-fired boilers, against which 4 p.ct. by weight of sulphate of ammonia and 4 p.ct. by weight of tar were recovered.

An incidental advantage of gas-firing was the cleanliness of the boiler-house and the better control of the fuel supply. There should also be a slight reduction in the labour and maintenance costs. On the other hand, the efficiencies claimed for gas-producers were only possible with a high load factor; and in the case of central stations, it would be necessary in most cases to supplement gas-firing with coal-fired boilers for dealing with fluctuations of load. It was apparent, therefore, that the whole case for gas-firing from producer plant rests on the production of bye-products. The most valuable of these is sulphate of ammonia. The amount of this bye-product depended on the percentage of nitrogen present in the fuel. The average for British

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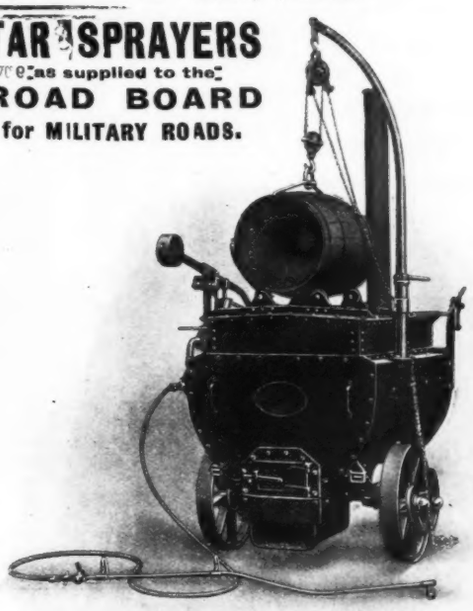

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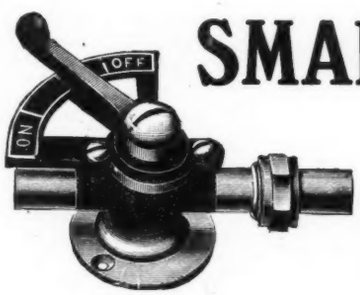

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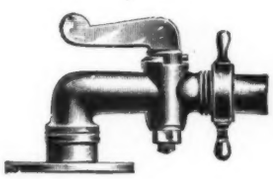

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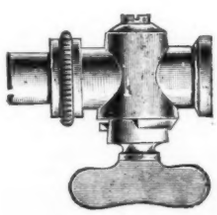

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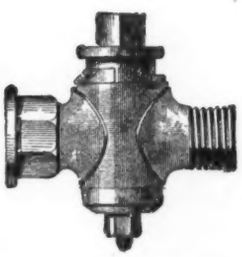

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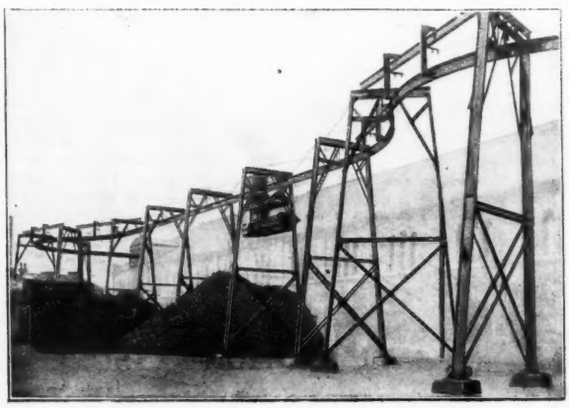

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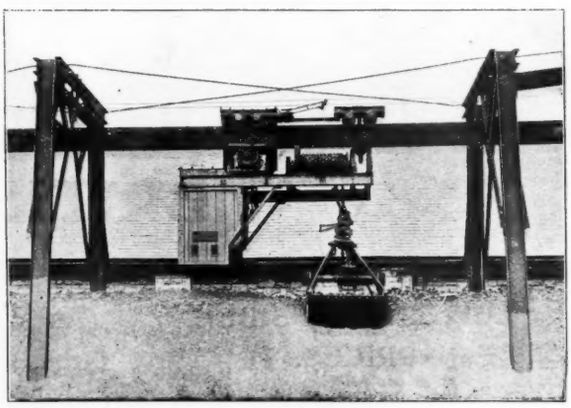

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coals might be taken at 1·3 p.ct., yielding (in a "Mond" producer) from 80 to 90 lbs. of sulphate of ammonia per ton carbonized.

The following estimate, based on results obtained from smaller plant, was put forward as an illustration of what might be expected from a producer gas-fired boiler installation of 20,000 KW. capacity, dealing with a maximum demand of 15,000 KW. and operating with a 40 p.ct. station load factor.

Direct Firing. (*Boiler Efficiency* 80 *p.ct.*)

53,000,000 Kelvins at (say) 2 lbs. of coal per unit generated, tons =	48,000
Coal at 15s. . . . . =	£36,000

Gas-Producer and Gas-Fired Boilers with Bye-Product Recovery.

Boiler efficiency, 90 p.ct.—Combined efficiency, 52 p.ct.

74,000 tons of coal at 15s.		£55,500
2960 tons of acid at £2		5,920
Extra labour on gas plant at 1s. 3d. per ton carbonized .		4,625
Extra stores		1,500
Extra labour on bye-product recovery, including bagging sulphate of ammonia		2,850
Interest, depreciation, and maintenance on cost of producer and recovery plant, 15 p.ct. on £52,000 . . .		7,800
		£78,195
Less 2960 tons of sulphate of ammonia at £14 per ton	£41,440	
Less 2960 tons of tar at £1 per ton	2,960	
		44,400
		£33,795
A saving per annum over direct firing of		£2,205

[The figure of £14 for sulphate of ammonia is above the average price received during the last ten years, but about £2 less than the present war price of £16 per ton. If the present price is taken, the saving would be increased from £2205 to £8125. On the other hand, on the basis of £12 per ton, which approximates to the average pre-war price, the saving of £2205 would be converted into a loss of £3715.]

Although producers had been in operation for twenty years, it was not suggested that finality of design had been reached. Experiments had recently been made with a view to utilizing the heat generated by the producer to supply the steam required for bye-product recovery; and it was possible that developments in this direction might increase the producer efficiency by 8 or 10 p.ct. It had also been shown that producers could deal successfully with the lower grades of fuel; and as these poorer grades frequently contained as high a percentage of nitrogen as the richer grades, it might be possible to utilize the producer with bye-product recovery for burning grades of coal which it was not profitable under present conditions to bring to the surface.

The distillation of coal at low temperatures for the primary purpose of producing metallurgical coke, and yielding besides a quantity of surplus gas of high calorific value in addition to other bye-products, had been advocated in certain quarters as a universal solution of the fuel economy problem. The low temperature at which the coal was distilled permitted of the recovery of bye-products, which were lost in the producer system. The chief of these were benzol and a rich quality of tar, from which were produced toluolene, naphtha, picric acid, and the basic materials for the manufacture of aniline dyes. Each ton of coal distilled produced about 15 cwt. of hard blast-furnace coke, which at present had a higher market price than its equivalent weight in coal. On the other hand, the yield of ammonia was less than from gas-producers—being about 25 to 30 lbs. per ton of coal. Hitherto the industry had been confined to steel-works and collieries, where its advantages were unquestioned; but the importance of the bye-products recovered, and the possibility of utilizing the surplus gas, had drawn attention to the possibility of combining low-temperature distillation with the production of power. The surplus gas was about equivalent to 4000 to 5000 c.ft. per ton, of a calorific value of approximately 550 B.Th.U. per cubic foot. The expense of installation, however, was very great, and the quantity of coal consumed to produce a given amount of heat in the form of surplus gas was about twelve to fourteen times as much as would be required for direct firing. Very little consideration was required to show that, as a means of producing power, the coke-oven could have only limited application. The demand for electricity in the form of light, power, and heat, was bound to exceed enormously the demand for coke and bye-products; and while the surplus heat from coke-oven gas should be fully utilized, either in independent power stations or, where convenient, in conjunction with larger power systems, the process could not be looked on as more than a partial solution of the fuel economy problem. It was claimed that, instead of metallurgical coke, a soft smokeless fuel could be produced suitable for domestic purposes; and proposals had been put forward to combine an installation for producing such a fuel with a central power station—the surplus gas being employed to fire the boilers. An arrangement of this kind could only have local and temporary application; and the burning of fuel for domestic purposes must ultimately be superseded by electricity. To set up a process with the object of producing fuel for cooking and heating was to perpetuate a custom which all were agreed should be superseded not only for reasons of fuel economy but also with a view to saving labour now employed in unnecessary domestic drudgery.

Mr. S. Z. DE FERRANTI fully agreed with Mr. Robertson in his conclusions as to the desirability or the reverse of carbonizing coal, obtaining the bye-products, and turning the resultant gas into electricity. Years ago he knew of a case in which a large number of gas-producers were put down—the very latest plant of its kind at the time—with recovery plants; and it worked successfully. The next installation of producers was installed without any recovery plant; it being found that the advantages to be derived from the bye-products were very largely used up in the cost of the recovery of them. This was an unfortunate position. The gas-engine, for what it was worth, he considered to be more handicapped by the inefficiency of gas making than by its own natural troubles. Yet he could not feel that this state of things would be permanent; and he believed that means would be found for getting the bye-products out of the coal without sacrificing very much of the heat units which would go to generate electricity, or without involving labour costs which would unduly handicap the process. Sulphate of ammonia and the other bye-products he did not see were very much use to the country at the present prices. When he spoke on this subject in his Presidential Address to the Institution of Electrical Engineers in 1910, he had in mind sulphate of ammonia for agricultural purposes at £8 per ton, not £12 or £14. If this price could be realized by the economical handling of the coal without the handicaps he had mentioned, then he thought there would be a vast demand for the nitrogen compounds, and a corresponding increase in efficiency of what again was beginning to be looked upon as a matter of vital importance—viz., the agriculture of the country. From this, however, it must not be inferred that he did not attach the greatest importance to every effort that could be made to deal with coal in the most economical manner, with the object, of course, of producing electricity at the cheapest possible rate, which, next to finding a solution for some of our very serious social problems, most vitally affected the welfare of the country.

Bailie SMITH (Glasgow) referred to the experiment that was started in Glasgow about three years ago in the carbonization of coal under the auspices of a Joint Committee of the Electricity and Gas Committees. At the meeting of the Association last year, he had promised to give further details, probably in a paper this year; but the Editing Committee thought it was a little early to give all the details. Nevertheless, the experiment had been going on for a sufficient time to give practical results. The plant carbonized 20 tons of coal a day. It was making a pure gas for firing boilers; and at the same time they were recovering bye-products of considerable value at a very low capital cost for plant and at comparatively no working expenses. The Glasgow experiments showed a very great advance on the calculation given by Mr. Robertson of a gas-producer and gas-fired boilers with bye-product recovery. The plant there was given as costing £52,000; but on the M'Laurin process, which was being used at Glasgow, for dealing with the same quantity of coal, the cost at present prices would only be £13,000, and the saving on the 15 p.ct. interest would be £5850. The plant would give about the same quantity of sulphate of ammonia; but whereas Mr. Robertson allowed £1 per ton for the tar, by the M'Laurin process there was the startling result that there was no tar. It gave, however, about 16 gallons of liquid per ton of coal, for which they could get at the very lowest 3d. per gallon. This would bring in £14,800, instead of the £2960 for the tar. Thus the total saving would amount to £19,895. Furthermore, it was possible to use in a carbonization process lower grade coals at a lower price—coals containing very high percentages of ash, such as cannel coal, not now required for gas making. These poorer coals were much richer in ammonia and oils; so that there was the possibility of a still greater saving. Another saving in the M'Laurin process was in the steam, which was only 1 lb. per pound of coal, against 2½ lbs. per pound of coal with the Mond system. The liquid he had referred to divided up into heavy resins; and as part of these resins they had a series of dyes direct—not aniline dyes carried through three or four or five processes of coal tar, but the resins themselves dissolved in alkali or acid gave a large series of dyes. [The speaker showed a few samples of these.] This led to the belief that they would get more for this bye-product than the 3d. a gallon he had mentioned when the commercial possibilities of these dyes were realized. Out of the ammonia liquor they got a series of grey dyes without any preparation whatever. The process enabled them to go even further than this, because it involved the manufacture of a smokeless fuel. In other words, at such hours during the day that it was not desired to make gas, smokeless fuel could be produced instead. In this fuel it was not necessary to leave the same amount of volatile matter as was left in coke to make it easy of burning; and there would be an advantage there. In the M'Laurin process, the coke came out in the form of an amorphous carbon, whereas out of the gas-retort the coke came in the form of a carbon that had been partially turned into graphite; and the difference in the burning qualities of graphite and an amorphous carbon were well known. He differed from Mr. Robertson as to the uses to which a smokeless fuel could be put. He fully believed that for very many years yet to come there would be a great demand for a smokeless fuel. To-day it did not pay—it might not pay for years—to warm each room by electricity. He thought they would admit that it did not pay yet to boil the water for a house by electricity; and this was a case where an amorphous coke or smokeless fuel would be in great demand. Again, in every house there should be one grate available which could act as a destructor of the waste refuse produced in the house. Furthermore, it would be far into the future before every farmhouse and every remote village would be supplied by electricity; and in these cases a smokeless fuel would replace the raw coal now being used. It might even be practicable to fire the boilers of steamers and locomotives with smokeless fuel, if only it were cheap enough. This smokeless fuel would also do away with the waste now going on in domestic grates through the burning of raw coal. They obtained 13 cwt. of smokeless fuel per ton of coal; and if coal was burned in one grate and smokeless fuel in another, it would be found that there was much more radiant heat from the smokeless fuel than from the raw coal, because the raw coal used a certain amount of its own heat of combustion to distil its own bye-products, which were carried off up the chimney in a very disagreeable form. Thus, with 13 cwt. of smokeless fuel more radiant heat was put into the room than with one ton of coal. There would also be the 16 gallons of liquid, which he would for the moment take at 3d. per gallon, making 4s.; there would be 30 to 50 lbs. of sulphate of ammonia, making 4s. to 6s. on present prices; and, in addition, there would be 12,000 c.ft. of 300 B.Th.U. gas. On the whole, therefore, it seemed that this little experiment at Glasgow had anticipated the time when there would be linking-up not only of electricity departments among themselves, but of electricity departments and gas departments.

Mr. C. H. WORDINGHAM (the President of the Institution of Electrical Engineers) thought they must make up their minds whether they were going to approach this problem simply from the point of view of generating cheap electric power or from the point of view of making the most of that national asset, coal. He took the view that they

should treat the coal so as to recover all the valuable bye-products. He had had a good many bricks thrown at him from both sides for advocating a combination of electricity and gas interests; but he had long held the opinion—and the criticism he had heard of it had convinced him more than ever that he was right—that it was folly to throw away the vast experience of the gas managers of this country in the proper utilization of coal for the recovery of the bye-products. In the true interests of national economy there should be that broad spirit that had been referred to, and that the best use should be made of the existing knowledge both of electrical engineers and gas engineers in order to get the maximum possible out of the coal.

Mr. W. M. SELVEY, consulting engineer and fuel testing expert of Sheffield, said the question of the carbonization of coal was an extraordinarily difficult subject in relation to the supply of electricity, because in so doing they were creating supplies of materials for which markets had to be found. Therefore, it was necessary to move very much more cautiously in this direction than merely in the direction of generating electricity at a cheap rate. Nevertheless, he believed that coal carbonization in connection with electricity supply was a problem which would have to be faced.

Mr. ROBERTSON, in his reply on this aspect of the subject, said that Bailie Smith's criticism of his gas-producer scheme was not quite intelligible to him. The figures were checked by an engineer who had been connected for twenty years with power producer plants, who could not accept the correction that had been made on the basis of the Glasgow plant, which was only carbonizing 20 tons per day. The value of the bye-products at Glasgow was certainly very striking. He believed the installation was a combination of the Mond producer and the coke-oven process with low-temperature distillation and recovery of a much wider range of bye-products than was now possible in the Mond process. It was also an interesting item of information that the amount of steam per pound of coal could be so greatly reduced. Generally, however, he questioned whether the demand for the bye-products would keep pace with the demand for cheap electricity; and it became a question as to whether these bye-products could not be more cheaply obtained by some other process than the carbonization of coal. At the same time, he believed that most electrical engineers had an open mind on the matter. The combination of electricity and gas works, as suggested by Mr. Wordingham, did not appeal to electrical engineers; but if by so doing there would be economies in the nation's coal supplies, there was no reason why it should not take place. They could not afford, in view of the intensity of competition after the war, for the sake of sentiment to waste anything in the matter of fuel supplies.

FOOD SAVING CAMPAIGN.

Gas for Preserving Fruit and Vegetables.

Realizing how necessary it is, with raw materials advancing steadily in cost, that gas companies should secure (with a minimum expenditure of capital and at maximum prices for the product) an immediate increase in their sales of gas, if they are to offset the extra expenses that must be borne, the National Commercial Gas Association of America have appropriated a sum of $2000 to the starting of a campaign for home canning and preserving. To give an idea of the importance of the proposal, they point out that, gas being the ideal fuel for cooking fruit and vegetables, it can confidently be assumed that among the 20,000,000 consumers in the United States a campaign of the magnitude and character outlined will bring about an increased consumption of gas in the household amounting on the average to at least 25 c. per month per consumer.

Between June and November, this will mean an increase in revenue of $20,000,000 to $30,000,000 for the gas industry. In addition, however, to the business aspect, the fact is emphasized that "the gas company that co-operates in this national campaign is co-operating with the Government, and is showing its patriotism in a tangible manner." In the States, as here, it seems, a serious food shortage is so imminent that every effort is being made by the Government and the people to supply help to the farmers and to utilize all unused ground for gardens; and a complement of these efforts is the preserving and canning, through which means 50 p.ct. of the food raised can be saved from the usual waste. The campaign was to start on June 1, and to last until the end of the year. The country is to be flooded with coloured posters, of which there will be a fresh one each month from June to November; and the plan is for each company to secure a supply of the posters every month, and display them. There will also be monthly folders, giving instructions to housewives on how to use gas in the processes of canning and preserving described. Each folder will deal with fruits and vegetables as they come into season. The Association will also furnish once a month a suggestion for a window display prepared as a working demonstration, and will prepare a series of lectures; and to all this will be added numerous articles and a large amount of literature, to be furnished by the Department of Agriculture.

Institution of Gas Engineers,—A special general meeting of the Institution will be held at the Institution of Civil Engineers, Great George Street, S.W., at 3.30 on Thursday, the 5th prox., for the purpose of submitting for confirmation the alteration to the Articles of Association which was passed at the annual general meeting. The President (Lord Moulton, K.C.B., F.R.S.) will, on behalf of the Council, propose the election to honorary membership of the Institution of Dr. F. Mollwo Perkin, F.I.C., and Mr. D. Milne Watson, M.A., LL.B., the Managing Director of the Gas Light and Coke Company.

IGNITION POINTS OF LIQUID FUELS.

In the current issue of the "Engineer" is an article by Mr. Harold Moore, M.Sc., in which he deals exhaustively with the spontaneous ignition temperatures of liquid fuels—that is, the temperature at which a substance surrounded with oxygen or air at the same temperature will burst into flame without the application of any spark or other local high temperature.

The article is accompanied by a table [some of the figures of which are reproduced] of the ignition points of the more important liquid fuels:

Spontaneous Ignition Temperatures in Oxygen.

Description.	Spec. Grav. 20° C.	Temp. of Spont. Ignition. In Oxygen. Deg. C.
Oil-gas tar distillates—		
"Special distillate" of oil-gas tar	·995	429
Oil-gas tar creosote	1·036	473
Oil-gas tar—		
Water-gas tar	1·080	445
Carburetted water-gas tar	1·053	445
" " "	1·078	437
Water-gas tar	1·074	464
Raw tars—		
Horizontal retort tar	1·114	445
" " "	1·123	454
Blast-furnace tar	1·172	498
Tar—low temperature carbonization	·987	307
Vertical retort tar	1·102	474
Coke-oven tar (Simon-Carvès ovens)	1·132	494
Coke-oven tar (Koppers ovens)	1·145	495
" " (Coppée ovens)	1 140	488
Tar distillates—		
Benzol, 100 per cent.	·875	566
Toluol, 90 per cent.	·863	516
Xylol (commercial)	·860	484
Premier tarless retort tar oil	·992	349
Paris Gas-Works coal-tar oil	1·080	449
Coke-oven tar oil	1·046	478
Creosote oil	1·010	415
Blast-furnace creosote oil	·988	463

MEASUREMENT OF HIGH TEMPERATURES.

A lecture delivered to the Steel Treating Research Club of Detroit by Mr. Richard P. Brown, the President of the Brown Instrument Company, traces the evolution of high-temperature measurement from ancient to modern times, and forecasts the lines of future development.

For temperatures above 1000°, he said, the thermo-electric principle was preferred, which comprised a thermo-couple, a measuring device, and connecting wires. The first consisted of two wires of different metals joined together, and exposed at the joint to the temperature to be measured, when a minute current of electricity was generated. Wires of precious metals for high temperature measurements, such as pure platinum and platinum-rhodium alloy (9 : 1), generated only ten-thousandths of a volt at 2000°; the baser metals, such as iron and copper-nickel, which were suitable for moderate temperatures, would give one-twentieth volt at the same temperature. Experience indicated that for low degrees, up to 200°, a bismuth and antimony couple gave the best results; up to 1000°, iron and copper-nickel (40 : 60); as high as 1800°, nickel-chromium and nickel-aluminium (98 : 2), for short periods only; and for constant service at high temperatures, the platinum-rhodium couple was recommended. The General Motor Company, of Detroit, had adopted a base metal couple known as "Simanial"—an abbreviation from its composition of silica, manganese, nickel, and aluminium. The base metal couples were made in all diameters between one-hundredth and one-quarter inch; but exceedingly small diameters were essential for sensitiveness and quick reading. Platinum-rhodium couples were usually one-fiftieth inch; but he had known one-hundredth inch to be used for exploring Welsbach mantles. Base metal couples, even if constructed from the same stock material, were liable to vary within 25° either way at 1400°, nickel-chromium might differ 15°; and, so far, attempts to meet this difficulty were not successful. By reducing the voltage at the terminals, however, by means of a shunt of manganin wire, he had been able to produce a couple that could be depended on for definite voltage within a limit of 4°; and it should be adjusted once a month or oftener in an electric furnace. In some of the base metal makes, resistance wire was placed in series on one side of the resistance couple; but this had the drawback that it would only operate satisfactorily when the thermo-couple resistance was exactly equal. With platinum-rhodium, the voltage was so small that there was none to spare for resistance. The couple must be insulated—a wrapping of asbestos painted with sodium silicate being commonly employed; but a better form, that did not disintegrate so rapidly, was lava or porcelain beads threaded over the wire. Only the best and purest porcelain or fire-clay should be used for platinum. Up to 1400°, a high-grade wrought-iron tube impregnated with alumina could be used as an outer protection, and nickel-chromium up to 1800°. The longer life thus secured justified the increase of cost. The platinum protection must be impervious to gases, and quartz answered well below its softening point of about 2400°. Tubes of porcelain should also have an outer tube of graphite or fire-clay as a further protection against sudden temperature changes.

As the resistance depended on the difference in temperature between the hot junction exposed in the furnace and the cold junction with the leads of the instrument, the latter must evidently be maintained

at a constant temperature, or some compensating arrangement used. The methods of ensuring this result were next considered. The cold junction should be quite out of reach of radiation from the furnace casing; and the plan recommended was to carry it 10 ft. or more below ground (at which depth a fairly constant temperature prevailed at all seasons of the year), which could readily be accomplished by driving down a pointed containing pipe. If this was not practicable, compensation boxes could be used, or a resistance that could be adjusted to suit temperature variations at this point.

Voltage could be measured by the multivoltmeter or the potentiometer. A reliable form of the first was on the market, but the other was preferred for delicate work as giving greater precision, though it had the disadvantage of not being direct reading.

In his concluding remarks, the author referred to the importance of periodically testing and adjusting pyrometers of any make, to the methods available for this purpose, to the importance of employing only experienced and competent men for fixing, and to possible future developments. The more promising lines were the improvement of optical, resistance, and thermo-electric pyrometers. The resistance of the direct reading multivoltmeter might be greatly increased, and the more the internal resistance can be raised, without sacrificing strength of construction, the better the instrument. With the potentiometer method, there was room for a direct reading, and a simpler and less delicate indicator. The greatest prospect for the development of pyrometry in practice was in the direction of automatic temperature control. He exhibited an instrument of this class, suited for electric furnaces, in which solenoid operated switches varied the current through a rheostat, which would maintain a constant temperature within 10°, and said that satisfactory progress was being made in the application of the same principle to gas-furnaces. He had also devised a system of different coloured lights—red, clear, and blue—that would indicate to a distance if the temperature was low, correct, or high—a useful arrangement for uneducated men. The system could also be applied to signal from a central observation point.

SIXTY YEARS AGO.

From the "Journal" for June, 1857.

Gas Lights for Railway Carriages.—A very successful experiment was made a few evenings ago in lighting a railway carriage by gas, between London and York. Mr. Knapton, of the Albion Foundry, York, and the patentee of a flexible dry gasholder, has been making several trials of a mode of applying gas for lighting railway trains. The trips between York and Doncaster, and other neighbouring stations, having proved perfectly satisfactory, the Directors of the Great Northern Railway determined that the scheme should be tested for long journeys. They had a first-class carriage fitted up with the requisite apparatus, and on Wednesday evening last the carriage was attached to the Edinburgh express, which leaves King's Cross at 8.50 p.m. The gasholder was filled, and connected with three argand burners, fixed in lieu of the ordinary lamps. The gas was lighted before leaving the station, and allowed to burn throughout the entire journey. On reaching York, it was found that about 60 c.ft. of gas had been consumed, thus showing that the cost of each light was scarcely 1d., or about one-twelfth of the cost of the oil in the lamps at present in use. The apparatus is in itself exceedingly simple, and scarcely any effect is produced on the lights by the vibration or oscillation of the carriage.

Coal Tar for Roads.—Sir,—I cannot help being amused at the observations of the learned Metropolitan guardians of our health as to the nuisance arising from the use of crude gas tar for coating the gasholders and other ironwork. Let any one of them pay a visit to Sheffield or Nottingham, and he will find nearly all the public roads made and repaired with a species of concrete formed of crude coal tar and broken stones, without any detriment to the public health or the convenience of the inhabitants.—"G. H."

Gas in Hospitals.

With the establishment of the war hospitals which it has unhappily been necessary to bring into being up and down the country, a vast amount of widely-spread experience has been gained with regard to the eminent suitability of gas for cooking, heating, and lighting purposes in such places. It is, however, by no means only in connection with the more or less temporary institutions of this character that gas has proved to be so largely used. The economy and efficiency from all points of view of gas as fuel are also demonstrated by numberless installations of apparatus in permanent hospitals. Much valuable information for those interested in either class of establishment is to be found in the Hospital Administrators' Number (June issue) of "A Thousand-and-One Uses for Gas," published by the British Commercial Gas Association. There are photographs of actual installations of cookers, fires, and hot-water heating apparatus; and these accompany a series of articles dealing with all the practical points that call for consideration. One striking illustration is of a ward kitchen at St. Bartholomew's Hospital, showing a combination range, comprising gas-fire, oven, hot closet, and hot plate. Gas is, of course, of the greatest possible use for many special processes carried on in hospitals—such as sterilizing, disinfecting, pasteurization, laundry purposes, power generation—and reference to all these matters is made.

REGISTER OF PATENTS.

Carbonizing Peat and Obtaining Distillates therefrom.
No. 106,121.

WHITFIELD, C., of Kettering.

No. 6534; May 6, 1916.

This invention has for its primary object the complete carbonization of coal, lignite, peat, sewage sludge, seaweed, sawdust, and the like, and simultaneously obtaining "the highest yield of distillates therefrom at the lowest temperatures." A further object is the utilization of the condensed products, after cooling, in the continuous condensation of the new products. A still further object is to utilize the heat of the incondensible products in the evaporation (or concentration) of the new distillates.

The desired results are claimed to be obtained by utilizing the gaseous products of combustion from a gas-fire, first, to carbonize the material, and then to pass through or over the material while the latter is on its way to the carbonizing area, the gaseous products of combustion acting as a vehicle for the distillates, which may afterwards be condensed-out.

The apparatus employed is similar to a power-gas producer. Within the upper part of the carbonizing chamber is fitted a series of revolving plates and fixed scrapers—the former being carried by a central shaft, and the latter (one of which lies immediately above each plate) being adjustably and removably carried by the sides of the producer. The revolving plates are carried by a central shaft, the upper end of which extends through the upper end of the producer and is there fitted with a bevel wheel. Meshing with the wheel is a further wheel carried by a horizontal driving shaft.

In the lower part of the producer is (by preference) an arrangement of gas-burners, supplied with gas and air under pressure. The position of the burners, relatively to the bottom revolving plate, is such that only the gaseous products of combustion can reach the material to be carbonized, the lower part of the chamber being closed against the ingress of free oxygen, in order that the products of combustion shall be of a neutral or reducing character.

With the material to be treated fed into the producer, it falls upon an upper revolving plate, from which it is swept by a fixed scraper through an aperture in the plate. Falling on to a second plate below, the material is swept off by another of the scrapers on to the next plate below, and so on with each succeeding plate, until the material, fully carbonized, finally drops on to the lowest fixed plate, or into the lower part of the producer, whence it may be withdrawn. As the material moves down, the distillates are carried upwards by the products of combustion, and away to the outlet.

Owing to the products of combustion gradually losing their sensible heat, and being of either a neutral or reducing character, no combustion of the material itself takes place; and as the temperature is gradually falling, those distillates which evaporate at a low temperature are not detrimentally affected. As the material passes from plate to plate, it is spread out over a large area, and is gradually heated by the products of combustion. Similarly, the products of combustion and the distillates meet the cooler materials as they pass to the outlet. In this way the highest yield of distillates is obtained at a comparatively low temperature. The distillates, after leaving the producer, are condensed by any suitable cooling appliance; and in this connection it is pointed out that the steam or watery vapours condensed out of the distillates may, after cooling, be used to cool the new distillates. And, further, the heat produced by burning the non-condensible products may be used for the re-evaporation (or concentration) of the distillates.

Detecting the Presence of Combustible Gases.
No. 106,427.

PHILIP, A., and STEELE, L. J., of Portsmouth.

No. 16,750; Nov. 22, 1916.

This apparatus for detecting the presence of combustible gases is of the type in which the indication depends upon a difference in the temperature of a catalytic substance allowed to become active and another substance prevented from becoming active. It has been recognized, the patentees point out, that it is desirable to use catalytic wires of materials having the same properties, both as regards radiation of heat and temperature coefficient of resistance, as has been described in patent No. 27,281 of 1911.

A practical arrangement there described consisted in employing two active catalytic wires and two inactive wires, the latter of which, however, were of catalytic material. The four wires were arranged alternately as the arms of a Wheatstone bridge; and it is usual in this arrangement to employ four exactly similar wires, and to prevent any combustible gas from having access to the inactive catalytic wires, so that any catalytic action upon them cannot take place. However, difficulties have been found to arise when making a practical apparatus upon these lines. If the inactive catalytic wires are completely sealed up, an error in the indications of the instrument is introduced, caused by the difference between the pressures in the atmosphere in contact with the active catalytic wires and that in contact with the inactive catalytic wires; and this difference of pressure in its turn causes the rate of loss of heat from the two pairs of wires to be different.

The object of the present invention is to overcome this difficulty, and to produce a reliable instrument in which the inactive wires are prevented from being reached by the gases to be tested, but in which at the same time the atmosphere around both the active and inactive wires is always maintained at the same pressure at any given moment. Means therefore are provided for ensuring that the pressure of the atmosphere surrounding the active catalytic wires is the same as that of the atmosphere surrounding the inactive wires, while the gases to be tested which may contain conbustible matter are never allowed to come

into contact with the latter. Thus the effect of the pressure of the atmospheres upon the rate of loss of heat is the same for both the active catalytic wires and the inactive ones.

Furnaces Heated by Gaseous Combustion. No. 106,546.

IONIDES, A. C., JUN., of Porchester Terrace, W.

No. 8741; June 21, 1916.

This invention relates to the combustion of gaseous mixtures in closed combustion spaces, and to the preventing of firing-back from the delivery nozzles to the mixing point.

For the purpose of producing gaseous combustion, it has been proposed, the patentee points out, to introduce into a bed of refractory granular material a mixture of combustible gas and air in proper proportions at a velocity which (due to the length and cross-section of the conduit) is greater than the speed of ignition of the mixture. It has also been proposed to terminate a metal pipe which conveys the mixture sufficiently far from the bed to prevent its end becoming unduly heated, or else to water-cool the pipe in any desired manner.

In patent No. 23,350 of 1913 there was described a nozzle delivering the mixture tangentially into a furnace chamber [patent No. 2839 of 1912] of a construction which is closed at the bottom and enclosed in an outer chamber closed at the top—the gases finding vent downwardly through an annulus. The nozzle was close up to the furnace chamber, and gave good results with self-burning mixtures having practically no excess of either constituent. In this case, the mixing of the constituents took place progressively in the rear part of the nozzle. In subsequent patents [No. 26,259 of 1913, No. 15,778 of 1914, No. 9568 of 1915, No. 102,983 and No. 105,810] various other furnace arrangements were shown in which the mixture is conducted as short a distance as practicable through a nozzle to deliver tangentially to the combustion chamber—several tangential nozzles being usually employed.

Now it has been found, it is claimed, that when very high temperatures are sought to be attained in furnaces of this class—in which the mixture is burnt in a more or less open chamber at a pressure in excess of that of the atmosphere, due to the downward displacement of the products of combustion—the combustion of a considerable volume of mixture in a comparatively open space immediately adjoining the nozzle mouthpiece produces a temperature which, when augmented by radiation from any adjacent surface upon which the jet impinges, becomes such that there is great difficulty in obtaining, without using excessive pressures, such a velocity of flow that back-firing can be prevented. The object of the present invention is so to construct such furnaces that other features in addition to the velocity of the current are employed to prevent back-firing.

The furnace suggested is of a type in which a nozzle tube of refractory material is preferably (by tapering) provided with a mouthpiece adapted to produce a high velocity jet of mixture which enters the chamber in which combustion takes places by way of a port of such greater cross sectional area and length that the mixture traverses the port as "a self-contained jet without substantial contact with the walls," and there is no impingement of the jet within a substantial distance of the termination of the port.

The invention further consists: (1) In a furnace in which a metal sleeve encircling the nozzle tube is provided for preventing the transmission of heat to the entering mixture behind the nozzle mouthpiece. (2) In a method of arranging or fitting an inlet nozzle of refractory material for a furnace consuming a self-burning gaseous mixture so that the nozzle is maintained at a low temperature by the encircling metallic sleeve which conducts the heat quickly away from the nozzle.

Incinerator or Refuse Destructor.—No. 106,567.

CREASEY, H. H., of Winchmore Hill, and DAVIS GAS-STOVE COMPANY, LTD., of Camberwell Road, S.E.

No. 11,761; Aug. 18, 1916.

This invention relates to a gas-fired incinerator or refuse destructor for use inside a domestic coal-grate, with the object of providing means whereby house refuse (such as potato peelings, pea shucks, tea leaves, cabbage and like waste, paper, &c.) can be readily destroyed. Another object is to provide means whereby a kitchen cooking range, a fireplace, or the like (not in regular use during hot weather) can be more conveniently and satisfactorily utilized for burning and destroying house refuse. This device is particularly adapted to be placed within a vacant kitchen coal-range or fire-grate—being fitted with one or more gas-burners and with means for retaining the house refuse so that it is burnt therein.

Scottish Gas Prices.—The Town Council of Grangemouth have reduced the price of gas from 5s. 5d. to 4s. 9d. per 1000 c.ft. for the summer months. The Meigle Gas Company have raised the price of gas for lighting to 10s. per 1000 c.ft., and for cooking and heating to 8s. 4d.

Government Compensation for Explosion Victims.—The Minister of Munitions announces that if, during the war, an explosion of munitions occurs at any factory or premises in the United Kingdom on which explosives used in ammunition or mines for naval or military purposes are manufactured, or are handled in the course of the manufacture of such ammunition or mines, he is prepared, without admitting or assuming legal liability, to consider favourably the payment (out of funds to which the manufacturers will contribute) of reasonable claims for compensation for personal injury or for loss arising from damage to property, directly attributable to the explosion. This announcement does not apply to claims for loss arising from damage to the factory or premises where the explosion occurs, or to property therein or thereon, or to claims for personal injury to persons employed or present in the factory or premises at the time of the explosion.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

The Gas Light and Coke Company's Bill was returned from the Commons with the amendments agreed to.

The Hemel Hempsted Gas Bill and the Lea Bridge District Gas Bill were returned from the Commons with amendments; and the amendments were agreed to.

HOUSE OF COMMONS.

Progress of Bills.

In the case of the Gas Light and Coke Company's Bill, the Lords' amendments were considered, and agreed to.

The Kenilworth Gas Bill was read the third time, and passed, with amendments.

The British Incandescent Mantle Company.

Mr. GILBERT asked whether the tender of Messrs. Curtis's and Harvey, which was accepted by the Board of Trade for the German-owned business of the British Incandescent Mantle Company, Ltd., was the third highest tender received; whether the highest tender was from a group who had already purchased two German-owned businesses from the Board; whether the second tender was from another group who had also previously purchased a German-owned business from the Board; what was the reason for accepting the third highest tender; and by what amounts did the first and second tenders exceed the amount of the tender which was accepted.

Mr. ROBERTS replied that the tender of Messrs. Curtis's and Harvey Ltd., was the highest tender received from any firm who appeared to the Board of Trade to possess the necessary technical experience to continue the business with success.

Coal Miners and Exemption.

Mr. HANCOCK asked whether coal mining is still an exempted trade; and, if so, why men who had worked at the pit during the whole of the last twenty years were being called up for service.

Mr. MACPHERSON said coal mining was not an "exempted" trade; but a coal miner who was in possession of a valid certificate of exemption issued by a Colliery Recruiting Court under the authority of the Home Office was not liable to be called up for service with the Colours.

Departmental Committee on Electricity.

Mr. P. A. HARRIS asked whether the Departmental Committee on electricity had prepared a report in favour of dividing the whole country into definite areas for the production of electricity; if so, whether such scheme involved the purchase of existing undertakings; and whether a member of the House of Commons would be appointed to serve on the Committee.

Mr. ROBERTS said the answer to the first part of the question was in the negative. The second part did not therefore arise; and, in reply to the third part, a member of the House of Commons was already serving on the Committee.

Mr. M'CALLUM SCOTT asked the President of the Board of Trade whether his attention had been called to the inadequate representation of local authorities owning electrical undertakings on the Committee appointed to consider and report on the future supply of electric power for all classes of consumers in the United Kingdom; and whether he proposed to take any action to give increased representation to municipal electrical undertakings in Scotland.

Mr. ROBERTS intimated that it had been decided to give increased representation on the Committee to local authorities owning electrical undertakings; and he was in communication with the Secretary for Scotland, with a view to the appointment of a representative of the interests of Scottish local authorities concerned.

LEGAL INTELLIGENCE.

KOPPERS COKE-OVEN PATENTS.

Story as to the Assignment of the Patents.

The Koppers coke-oven patents occupied the Patents Court for the whole day last Tuesday, after two previous hearings by the Controller (Mr. Temple Franks) and Sir Cornelius Dalton [*ante*, pp. 153, 346], and half-a-dozen hearings in Chancery, Divisional, and Appeal Courts of proceedings instituted by Mr. Albert Victor Derry, with the view of securing a declaration that the Patents Court had no jurisdiction to deal with these patents.

Messrs. Simon-Carvès, Ltd., applied for licences to use patents No. 20,870 of 1904 and No. 16,386 of 1905; and the position taken up by Mr. Derry, in opposing their application, was that, since the Patents Court had been invested with powers to consider applications relating to the patents of alien enemies, its jurisdiction was ousted in this instance because the English rights in these two patents had been vested in a partnership to which he was a party, and the title passed automatically to him as a British subject on the outbreak of war.

Mr. H. TERRELL, K.C., M.P. (Counsel for Mr. Derry), stated that this client was Mr. Kochs at the time of the alleged partnership agreement; and he, and a group of his relatives, by deed poll, adopted his mother's maiden surname, which was Derry. The other partners were

Koppers and a German named Altenhein, the latter of whom attended the Court with an escort from Wakefield, where he was interned. The other Courts had recommended Counsel to return to the Patents Court and place such evidence before it as would enable the Controller to decide whether the beneficial interest in the patents was in Koppers (in whose name they were registered) or the partnership. The Koppers coke-ovens had the advantage over ordinary retorts in that larger bulks of coal at a time can be fed for distillation, and the separation of the primary coal-tar bye-products—the ammonia, benzol, and toluol—is efficiently carried out, yielding at the same time a denser coke and one eminently suitable for metallurgical purposes. The ammonia is recovered as sulphate, and the crude benzol is subdivided into pure benzol, pure toluene, and solvent naphtha. Counsel explained that the partnership dated from April, 1902. Before that time, Mr. Kochs and Mr. Altenhein carried on an engineering business at Sheffield and were concerned mainly with the erection of coke-ovens and gas bye-product plant. When it was suggested that a partnership of three should exploit the Koppers patents in England, no proper deed of partnership was drawn up. Mr. Altenhein, in England, prepared a letter and sent it to Herr Koppers in Germany, and Koppers signed it and sent it back, accompanied by a letter which threw considerable light upon it. The agreement was that the engineering firm at Sheffield and Koppers should join forces to construct coal distillation plant on the principle which Koppers had protected by patents. There were 26 patents altogether. Koppers undertook to place any further improvements to be patented, and his own experience, at the disposal of the partnership; and this undertaking would cover these two patents. A translation of the main document contained these words: "Under this agreement, the firm of Kochs & Co. are, as it were, the sole representatives in Great Britain and Ireland of Herr Koppers, and must therefore enter into no further agencies for plant of the description in question. Koppers was to take a half share of the profits and expenses, and each of the others one-quarter. A sum of £250 was to be paid Koppers out of profits in respect of preliminary work and English fees for patents. The document said: "As the firm of Kochs & Co. have not been able to make any investigations to ascertain the validity of the patents, it is understood that all responsibility for the construction is to be borne by Herr Koppers alone, and the firm of Kochs & Co. will not be liable for any damages or for claims which may arise from the infringement of other patents." The letter of Koppers which accompanied the return of his signed document contained the words: "I send you herewith the agreement duly completed, to which I have added a small remark. The duration of our business relationship is to be unlimited—that is to say, indissoluble by any notice to terminate—and all my present and future experience, improvements, &c., are to be at the disposal of the new firm." The proportion of shares was to remain the same if, later on, the business should be sold or converted into a limited company. Koppers wrote that applications in respect of considerable improvements for securing bye-products was being made to the German Patents Office; "and if I procure the patents in England," he added, "we should have the best of prospects of crushing all competition." Koppers announced that certain furnaces with the improvements would shortly be completed, and then the English firm might bring English clients to see them in Germany, and soon nobody would be building any plant but Koppers.

Mr. HUNTER GRAY (for Messrs Simon-Carvès, Ltd.) observed that evidently the war had already begun.

Mr. TERRELL said they later found Koppers saying that certain improvements did not apply to the business of the partnership; but the word "improvements," of course, would be limited to improvements on the patents then in existence with which the Company had to do. They would find Koppers, for instance, in correspondence insisting on keeping separate an improved method he brought out of producing gas for house consumption. This had nothing to do with the particular patents he was assigning. Patents for dry distillation gases and also pure lighting gases did not pass into the possession of the Company. It was eventually proposed to form a limited company to take over the business of the partnership—the partners assigning the patents to the Company. Difficulties however arose; and the matter drifted and came to nothing. But in these negotiations they found Koppers saying: "You are not entitled to improvements in respect of the domestic gas plant, though you are entitled to improvements in the coke-oven and bye-product plant, which is the subject of our partnership." All this seemed conclusive that the English patents, and the improvements on the patents, were intended to belong to the partnership and not to Koppers. The cost of taking out all improvements had always been borne by the firm. With the outbreak of war, the partnership was *ipso facto* dissolved. Mr. Shuttleworth, its accountant, was appointed Controller by the Court, on the application of the Board of Trade, at the instance of Mr. Derry. He was familiar with the proceedings. He had seen Koppers; and he knew that the business throughout was conducted on the basis—all parties and Koppers acting on the basis—that the patents belonged to the partnership. Major Barker, the Solicitor to the Company, who had constant interviews with Koppers and prepared the documents which were to be executed when the transference to a limited company took place, would give evidence to the same effect.

The CONTROLLER said the opponents' case was that there had been no transference of the legal ownership from Koppers. This was clear. It was argued that the correspondence showed a constructive or implied trust. He thought that the correspondence, at the time the limited company was under discussion, showed that Koppers considered there would have to be an immediate transfer of the patents to the Kochs Company, as a step to transfer to the limited liability company.

Mr. TERRELL replied that in the year before the war they found Koppers instructing his patent agent in Germany to take the necessary steps to assign patents to the Company. If the idea of a limited company had been abandoned, there was still the idea of assigning new patents to the partnership.

Mr. *Derry* declared, in his evidence, that it was understood from the beginning that the patents belonged to the partnership.

By Mr. GRAY: No price was ever set down for them. He did not in the beginning look upon them as valuable. He was "buying a cat in a sack." It was because they were not concerned about the value that they did not put in the agreement, in so many words—"These patents are handed over to so-and-so."

Mr. GRAY: When subsequently you saw they were valuable, you regretted you did not see they were transferred to you by the agreement? I find Mr. Koppers writing to you, "What do I get in return for supplying you permanently with my experience." That does not convey the impression that he thought he was legally bound to hand over the patents to you?

Witness: The letter does not represent what was the original point of view. He was then trying to creep out of his obligation.

After Mr. *Altenhein* had given evidence,

The CONTROLLER adjourned the hearing for the attendance of Mr. Shuttleworth and Major Barker.

ACTIONS AGAINST THE DUBLIN GAS COMPANY.

In the King's Bench Division of the High Court of Ireland, before Mr. Justice Pim, an application was made on behalf of the Alliance and Dublin Consumers' Gas Company to have two actions at the suit of the Lights of London, Ltd., consolidated and tried together.

One action, it was explained, was to recover £128 2s. 5d., the price of machinery and goods sold and delivered by the plaintiffs to defendants at their request in connection with the installation of the "L.O.L." high-pressure system of gas heating and lighting in certain premises; and the second was to recover £186 for goods supplied and work done in connection with similar operations in other premises. There was a counterclaim by the Gas Company arising out of these transactions, which, it was stated, would be very difficult to segregate if the actions were tried separately.

For the plaintiffs, it was submitted that the correspondence showed the transaction with reference to one case to be on a direct contract between the parties; whereas in the other cases the plaintiffs were carrying out the work for other firms by direction of the defendant Company. The defendants had been paid for all the work done. Plaintiffs were, they further held, suing in different capacities in the two actions, which could not, therefore, be consolidated.

Having fully heard the arguments on both sides, his Lordship made an order consolidating the two actions, costs to be costs in the cause.

What is Cannel Coal?

In the City of London Court last Tuesday, before His Honour Judge Rentoul, K.C., Messrs. Cleeves & Co., coal merchants, sued Mr. F. Hawkyard, of the gas works, Upwell, near Wisbech, for £27 0s. 8d. for Nottingham cannel coal supplied. When the case was last before the Court [*ante*, p. 153], the defendant said that the coal delivered was not Nottingham cannel coal, but shale. He had the coal for gas making; but it was poor in quality, and the smell was so bad that the consumers threatened to discontinue the use of the gas. Mr. Finch (plaintiffs' Solicitor) said that the same coal was supplied with satisfaction to the Gas Light and Coke Company and several other gas undertakings. The case was adjourned for the defendant to get legal aid, and to raise a counter-claim for damages for alleged misrepresentation. Mr. Finch now said that the defendant had not raised any counter-claim, and therefore plaintiffs would prove their case. Mr. Kenyon Ault, plaintiffs' Sales Manager, said that he sold to the defendant a truck of Nottingham coal at 23s. 3d. per ton, and North Staffordshire coal at 26s. This was in May, 1916. Nottingham cannel was cannel coal produced from collieries in Nottingham, and North Staffordshire cannel was produced from collieries in that county. He ordered the coal from collieries in the respective counties; and it was delivered to defendant in the usual way. Defendant had admitted the receipt of the coal; but had said that it was subject to spontaneous combustion. Mr. Joshua Leech, the Manager of the Golden Hill Colliery, Stoke-on-Trent, said that the coal which they sent to the defendant was ordinary quality of North Staffordshire cannel. Mr. William Wright, the Secretary of the Woolaton Collieries Company, gave similar evidence as to the coal which they sent to the defendant. It was average quality of Nottingham cannel. Judgment was given for the plaintiffs, with costs.

A Director Sued.

At the Romford County Court on Monday of last week, before His Honour Judge Tindal Atkinson, the Griffin Gas-Stove Company, Ltd., sued Franz Blumenstein for money received on behalf of the plaintiffs and for an account to be taken, and also for the books of the Company in the possession of the defendant and certain patterns, and for damages for their detention. Mr. E. G. Palmer, for the plaintiffs, said that the Company was formed to exploit certain gas-stoves. It had not been a success yet. But it had considerable prospects if placed under capable management; and the existing Directors had great faith in the Company's future. The Company was formed in October, 1911. Defendant was appointed a Director for five years. He could not say whether defendant had been naturalized; but he was not re-elected at the end of his term of office. What it was desired to obtain was an account of defendant's transactions with the Company and the possession of certain chattels. Defendant still held the pass book, cheque book, day book, and ledger. Defendant said he was perfectly willing to render an account. He would like to have a stocktaking of articles belonging to the Company which were under his control; and he would be willing to give an order for the goods to be handed over to the Company. He held £500 in shares in the Company; and other shareholders whom he had induced to invest money in the concern looked to him to protect them. His Honour said it was clear that an account would have to be rendered, and there must be an order for the delivery of the goods which were in the possession of the persons named by the defendant. He granted a fortnight for the purpose, and adjourned the case to the July sitting at Ilford. An order was made for the delivery, within four days, of the books in defendant's possession.

MISCELLANEOUS NEWS.

SOUTH METROPOLITAN GAS COMPANY.

Increase in Price Notified.

The following notification, signed by Mr. F. M'Leod, the Secretary, is made to consumers of an increase in the price of gas.

It is with great regret that the Directors beg to give notice that, from the date of reading the meters for the quarter ending Midsummer, the price of gas to ordinary consumers will be raised to 3s. 1d. per 1000 c.ft., and in the same proportion to the consumers by slot-meters.

The necessity for this increase is entirely due to circumstances arising out of the war. The cost of coal into the Company's store has more than doubled. Freightage during the past twelve months has risen enormously; the present market rate being 20s. per ton, as compared with 3s. in the year 1914. The charges for labour have also greatly increased.

Having regard to the unprecedented rise in the cost of all commodities, this increased charge for gas will not appear immoderate; and consumers will appreciate the fact that no war profiteering can result therefrom, as under the sliding-scale the shareholders' dividend will be automatically reduced, while the employees' co-partnership bonus will, for the time being, disappear.

It has always been the policy of the South Metropolitan Company to supply gas at the lowest possible price; and consumers may confidently rely upon a reduction being made at the earliest possible date. Meanwhile, the Directors feel sure that all concerned—consumers, shareholders, and co-partners—will bear with patience the disadvantages of the present difficult times, and look forward with hope to a return of more prosperous days and the resumption of the mutual participation in the benefits that will follow.

THE HACKNEY PREFERENTIAL CHARGES CASE.

The following note appeared in the annual report of the Council of the Incorporated Municipal Electrical Association presented at last Thursday's meeting.

The members will be aware that the Gas Light and Coke Company are bringing an action against the Hackney Borough Council on a case of alleged preferential charging. The Council considered that Hackney had a very good case, and strongly recommended the members of the "I.M.E.A." to contribute towards their defence.

The Council take this opportunity of again reminding members that their promises of contribution should be sent in as early as possible, as doubtless, owing to pressure of work and shortness of staff in many undertakings, this matter has not yet received attention.

Another reference was made, incidentally, to the matter in the course of the discussion on profit-sharing schemes reported in another column. Mr. Ll. Robinson (the Borough Electrical Engineer at Hackney) called attention to the want of cohesion which exists between the municipalities of this country, which was, he said, strongly shown by the very meagre amount of support that was being tendered to his Borough Council at the present moment by the members of the Association in the fight they were having (which was a test fight) with the Gas Light and Coke Company. He hoped the members would take his words to heart and see if they could not do something better than was the case at present in the very important action which would be fought probably during next month.

CO-PARTNERSHIP.

The position of co-partnership in the gas industry, as it is affected by the war, found a place in a discussion upon profit-sharing schemes in the electrical industry which took place at the annual meeting of the Incorporated Municipal Electrical Association last Thursday.

The foundation of the discussion was a profit-sharing scheme that has been in force in connection with the Poplar municipal electricity undertaking during the past few years; but, of course, any municipal scheme of this nature must differ rather fundamentally from the co-partnership schemes of the gas industry. There are one or two other more or less similar schemes in other towns; but for the most part they have been confined to the granting of bonuses to the boiler-house staff according to the coal costs. There are several of these; but there are also one or two complete schemes in which the whole of the staff participate. The motive, naturally, is to imbue in the staff the personal interest which the originators of co-partnership have in view; and there is little doubt that it has succeeded, at any rate at Poplar and Burton-on-Trent—to mention two electricity departments which have inaugurated the policy. The real difficulty in municipal schemes is dealing with the profits. With a company they can be invested in the capital of the concern. But a municipality has no power to invest money on behalf of its employees; and there seems a disposition not to want to hand the men the profits in cash year by year. However, these are details which are more or less domestic—although the principle applies also to municipal gas undertakings, if it ever comes to be applied to them. We give a report of the extent to which co-partnership in the gas industry obtruded itself into the debate.

Alderman LITTLER (West Ham), speaking with regard to the possible position of labour towards profit-sharing with the electricity supply industry, said he was afraid, from information he had gained from men in the gas industry, that, whereas co-partnership had worked to some extent satisfactorily to the staff, the workmen in the gas-works did not look on it in any way with favour. This was a position the officials had to admit, and did admit, if only behind closed doors—that they had not got the results from co-partnership or profit-sharing which were anticipated by its authors.

Mr. E. W. MUNDY (Secretary of the Co-Partnership Association), dealing with this point, said the idea that co-partnership was not working satisfactorily in the gas industry had arisen from a speech made by Mr. Broadberry ten days or so ago—that co-partnership was to some extent admitted to be a failure in the gas industry. He believed that the number of people who agreed with Mr. Broadberry was very small. He had not yet been able to discuss the question with Mr. Broadberry or any of his staff so far. But one complaint made was that a large number of his men were leaving the gas-works to take up munition work; and Mr. Broadberry seemed to think that this was proof that the scheme had failed. In his (the speaker's) opinion, it was trying men rather high that, after they had received a bonus for about five or six years ranging from 5 to 8 p.ct.—in one case he believed it was 9 p.ct.—on their wages, the majority of which was received in the form of capital, to expect them to work for wages which had not very largely increased, when they were able to improve their position by going outside and obtaining wages which were double or even more what they were earning at the present time. And added to this, it would appear to many of these men an extremely patriotic thing to do. When he came to look at the figures, he found that the number of co-partnership schemes had steadily, before the war, increased from about 300 to about 700; but during the war the number had only fallen by about 100. He did not think this was a very large drop in circumstances such as the present. The attack on co-partnership really came to this, that it did not stand war conditions. A worker in a gas company, on this point, had said to him, that if he built a house he would probably put a slate roof on it, and if a bomb was dropped upon it the roof would be smashed up; but this did not prove that he had built his house badly. It was built for peace, not for war; and he did not intend, because of the war, to put a great mass of concrete on the next house he erected. This was the position; co-partnership was made for peace, not for war. Mr. Charles Carpenter, of the South Metropolitan Gas Company, had used repeatedly the strongest language as to the benefit which his Company had received from their co-partnership scheme during the war—not before the war. Mr. Carpenter remarked quite recently that he thought if one walked round the gas-works it was possible to spot the co-partner when working side by side with the outsider; and that there would be no difficulty in seeing which of the two men was the co-partner, because he would be working with a will compared with the outsider. Mr. Carpenter also maintained that he had had practically no trouble during the war; but he had been able to shift men from one job to another, and could even harry them to try and get work through. On the contrary, co-partners actually came to him and made suggestions that certain things should be done. They took a real personal interest in the success and the carrying-on of the South Metropolitan Gas Company; and he really thought—considering that the South Metropolitan Gas Company's scheme had existed for twenty-five years—it would be better to take Mr. Carpenter's very considered judgment rather than the views expressed by Mr. Broadberry. It was not always difficult to find out what the rank and file were thinking. His Association had made attempts at various times to get into direct contact with the workers in the gas industry; and he could only say that it had not been found that within the works there was antagonism to co-partnership. He was perfectly aware that there was very great antagonism among a certain section of trade unionists outside. When he was speaking in South London or elsewhere, there was always a trade unionist who got up and told him that co-partnership was a fraud and a failure, because the South Metropolitan Gas Company had had a strike. But the strike referred to was twenty-five years ago; and since that time there really had never been any trouble at all in the works. The scheme was worked out so that the men were brought into direct personal contact with the officials, and with the head of the business, Mr. Carpenter; and this undoubtedly had an extremely good effect both ways. He remembered years ago, the then head of the Gas Light and Coke Company, the late Sir Corbet Woodall, addressing a meeting of trade unionists in Birmingham, when there was a very frank and free and open discussion; and at the end Sir Corbet frankly admitted that he had learned a great deal that afternoon. He (the speaker) had asked Mr. Carpenter how it was that Sir Corbet Woodall should have learned from those trade unionists things which he felt sure that Mr. Carpenter already fully knew; and Mr. Carpenter pointed out the difference between the two schemes—that in the South Metropolitan Gas Company's scheme, he himself (Mr. Carpenter) was continually—as Chairman of a Committee consisting of representatives of the workers and of the staff—brought into contact with the workers, when the trade unionists very openly expressed their views, so that he got a knowledge of the desires and aspirations of trade unionism. This was only one of the benefits to be derived from a full scheme of co-partnership, because it seemed to him that any such scheme must begin with a financial benefit. But if it stopped there, he had no use for it. It must only be the beginning of a truer relationship between the management and labour. This was the great difficulty that was being faced at present; and as one read trade unionist speeches, one was brought more and more to feel that the co-partnership movement had been carried on upon right lines.

STAFFORD GAS SUPPLY.

Report on the Past Year's Working.

There has just been issued the report of the Gas and Electricity Committee of the Stafford Corporation for the year ended March 31 last, a copy of which is to hand from the Engineer and Manager, Mr. W. M. Valon.

The gas sent out from the works was 259,190,000 c.ft., compared with 260,357,000 c.ft. the previous year, showing a decrease of 1,167,000 c.ft.—a decrease entirely due to the drastic restrictions in public lighting. The gas actually accounted for on consumers' meters showed an increase of 1,281,670 c.ft., or 0·54 p.ct.; whereas the gas used in the public lamps showed a decrease of 8,018,373 c.ft., or 73 p.ct. The amount of revenue received was £30,897—being a decrease of £389.

Coal cost £22,238, compared with £20,189, being an increase of £2048; while residual products realized £12,933, as compared with

£10,163 the previous year, or an increase of £2771. The net cost of coal therefore amounted to £9305, as compared with £10,027, being a decrease of £722. This is, the Committee remark, perhaps the most satisfactory feature in the accounts.

The fittings account showed a profit of £699, compared with £263, being an increase of £436, which, "in view of the difficulties the Committee are experiencing in respect of labour and material, must be considered very gratifying."

The total revenue was £44,730, compared with £42,358, being an increase of £238; while the gross profit amounted to £7513, compared with £6968 the previous year.

After deducting all charges against net revenue account, there was a balance of £2728, out of which the sum of £935 has already been disbursed in respect of the workmen's bonus for the current year.

The Committee recommend that the available balance of £1792 be dealt with as follows: £1000 handed over to the district fund; £50 to the Free Library Committee; and the surplus (after payment of the bonus to employees) carried forward to next year's accounts.

The amount borrowed was increased by £1570 during the year; while repayments now amount to £86,707, leaving the sum of £42,447 outstanding against this account, as compared with £42,864.

The Committee estimate that the increase in the cost of coal to the department for the coming year will amount to some £2500 or £3000; and consequently they feel that unless the price of gas is again increased, the accounts cannot be expected to show a profit at the end of the present year's trading.

Appended to the report is an analysis of the Gas Department accounts, prepared by Mr. Valon, some of the figures of which are interesting for reproduction. The capital involved as at March 31 last was £42,447, or at the rate of £1 17s. 4d. per ton of coal carbonized, or 3s. 6d. per 1000 c.ft. of gas sold. The amount expended on fixed plant account, £122,693, has been reduced to £35,986 by the loans repaid under Corporation control. Some of the other results of the past year's working are:

Coal carbonized and the coal equivalent of oil and coke used in the manufacture of carburetted water gas	22,718 tons.
Gas made	259,040,000 cubic feet.
,, sold to private consumers	238,162,895
,, sold to public lamps, &c.	3,977,299
,, used at the offices and the works.	3,880,000
Average calorific value of gas supplied	510 B.Th.U. gross.
Gas made per ton of coal carbonized, &c.	11,400 cubic feet.
,, sold ,, ,, ,,	10,624 ,,
,, sold per cent. on output	93·19 per cent.
,, used at offices and works per cent. on output	1·8 ,,
Coke sold per ton of coal carbonized	9·56 cwt.
Average price at works of coke sold	19s. per ton.
Tar made	1151 t. 16 c. 3 q.
,, sold per ton of coal carbonized, &c.	9·9 gallons.
Average price at works of tar sold	24s. 1d. per ton.
Ammonium sulphate made	171 t. 15c.
,, ,, ,, per ton of coal carbonized	17·36 lbs.
Net proceeds of residuals per cent. on cost of coal, &c.	58·15 p.ct.

	£ s. d.	£ s. d.	Per Ton of Coal Carbonized. s. d.	s. d.
Coal, &c.		22,238 1 4		19 6·929
Less residuals—				
Coke	9,746 9 9		8 6·964	
Tar	1,361 0 5		1 2·378	
Sulphate of ammonia	1,724 15 10		1 6·222	
Benzol	101 1 4		0 1·067	
		12,933 7 4		11 4·632
Net for coal		9,304 14 0		8 2·297
Manufacture		6,467 0 10		5 8·319
Distribution		3,236 0 8		2 10·186
Rates, Taxes, and Insurance		1,261 10 4		1 1·327
Management		909 12 7		0 9·609
District fund—proportion of salaries		500 0 0		0 5·282
Bad debts		89 17 10		0 ·949
Law charges		9 6 8		0 ·098
Total working expenses		12,473 8 11		10 11·770
Sale of gas*		30,856 16 11		27 2·403
Coal and working expenses, less residuals		21,778 2 11		19 2·071
Profit on gas		9,118 14 0		8 0 332
Add profit on gas-fittings, less stove repairs, less hires		354 13 4		3·742
Gross profit		9,473 7 4		8 4·074
Add rents		46 17 5		·501
,, surplus from investments		359 19 5		3·802
		9,880 4 2		8 8·377
Income-tax, Interest on capital, Loans repaid account, Depreciation fund, Depreciation on stoves		7,197 11 0		6 4·037
Net profit		2,682 13 2		2 4·340
Add last year's balance		44 19 9		·475
		2,727 12 11		2 4·815
Less paid on account of current year's bonus		935 5 7		9·880
Balance		1,792 7 4		1 6·935

* After deducting £200 19s. 2d. cost o. repairs to public lamps, &c.

DUNDEE CORPORATION GAS ACCOUNTS.

At a recent meeting of the Dundee Town Council, the accounts of the Gas Department were submitted by the Treasurer, who stated that the financial affairs of the department were in a satisfactory condition. The quantity of gas sold was 999,655,500 c.ft., giving a revenue of £137,160; the average price realized per 1000 c.ft. being 2s. 8·62d. From coke, the revenue was £34,222, equal to 8·14d. per 1000 c.ft. of gas sold. Sulphate of ammonia produced £12,793, equal to 3·05d. per 1000 c.ft. sold, and tar £8407, equal to 2d. per 1000 c.ft. sold. The sum paid for coal was £93,240, equal to 1s. 10·18d. per 1000 c.ft. sold. The total income amounted to £193,532, and the total expenditure to £144,693; leaving a balance carried to net revenue account of £48,838. Annuities amounted to £5899, interest to £12,691, sinking fund to £18,177, and income-tax to £7893. There was also paid as allowances for men on military service £2935, and war bonus £426. The balance carried forward is £243. It is noted that the sum paid to the sinking fund would meet the repayment of the whole outstanding debt on the undertaking in about twenty years.

The working results show the coal gas made as 1,067,967,000 c.ft., and the carburetted water gas 36,071,000 c.ft. The coal carbonized was 92,230 tons, and oil used 3840 gallons; giving 11,970 c.ft. of gas yielded per ton. The quantity of tar made was equal to 11·57 gallons per ton of coal; sulphate of ammonia 28·73 lbs. per ton of coal; and coke saleable, 11·32 cwt. per ton of coal. The Corporation have their own tar-works; and it is observed that 749 tons of pitch was put through the retorts (horizontal) during the year. The net cost for coal per 1000 c.ft. of gas sold, less residuals, was 8·99d. Estimates were submitted for next year, showing a credit balance of £444; and it was agreed that the existing rate for gas—viz, 2s. 9d.—should continue.

The accounts and estimates were approved, and the Engineer, Mr. Alex. Yuill, was complimented on the success of the year's working.

OLDHAM CORPORATION GAS UNDERTAKING.

Annual Report and Accounts.

Submitting to the Oldham Corporation Gas Committee the statement of accounts compiled by the Borough Treasurer, together with the statistical tables, for the year ended March 24 last, Mr. Arthur Andrew (General Manager), whose resignation, owing to continued ill-health, after over fifty years' service, has already been recorded in the "JOURNAL," states that the gross revenue on the year for the gas-works amounts to £240,756, and the expenditure to £205,473. Thus the balance carried to profit and loss account is £35,283. Annuities, interest, and sinking fund charges amount to £29,929, leaving a net profit of £5354, to which is added the balance of £17,474 brought forward from the previous year, making a total of £22,828. Of this, £7619 is transferred to the reserve fund, £7500 to the borough fund, and £1650 is allocated to depreciation on cooking-stoves; the credit balance to be carried forward to the next account being £6059.

The amount realized for coke sold was much better than during the preceding year; being £52,015, as compared with £38,923. Tar receipts increased by £911; and the receipts for ammoniacal liquor also increased to the extent of £684, in spite of a decreased schedule of prices. There has been an average increase in the price paid for coal of 1s. per ton in all new contracts that were entered into during 1916. The net price realized per 1000 c.ft. of gas sold was 2s. 4·39d., as compared with 2s. 3·36d. in the previous year. The gas consumed by public lamps has been still further restricted; the total quantity used being only 15,542,000 c.ft. As compared with the last year of normal lighting, this shows a reduction of 87,412,000 c.ft.

The amount in the reserve fund on March 25 was £40,298. Interest has accrued to the fund to the extent of £1009. The number of men from the department who had joined the Colours up to March 25 was 183; and the amount of allowance made to such men during the year was £4041. The payment fixed by the Corporation is 10s. per week for single men and a maximum of 16s. per week for married men. During the year, there has been paid as bonus or war wage the sum of £3065. The war wage is as follows: Employees receiving 30s. per week and under, 5s. extra; exceeding 30s. and not exceeding 45s. per week, 4s. extra; exceeding 45s. and not exceeding 50s. per week, 3s. extra. In the case of clerks, this latter concession applies to men receiving up to 65s. per week.

The price of gas for all purposes per 1000 c.ft., and also the discount allowed therefrom if paid within the stipulated period, have during the past year been as follows:

	Price.	Discount.
	£ s. d.	£ s. d.
When the quarterly consumption is under 100,000 c.ft.	0 2 11	0 0 6
100,000 c.ft. to 500,000 c.ft.	0 2 10	0 0 6
500,000 c.ft. to 1,000,000 c.ft.	0 2 9½	0 0 6
1,000,000 c.ft. to 5,000,000 c.ft.	0 2 9	0 0 6
5,000,000 c.ft. and over	0 2 7½	0 0 6

By prepayment meter—30 c.ft. for 1d.

The quantity of gas manufactured was 1,538,664,000 c.ft., against 1,636,006,000 c.ft. in the preceding year, being a decrease of 97,342,000 c.ft. The following quantities of coal, &c., have been used in its production: Coal, 118,112 tons; gas oil, 31,640 gallons; pitch, 761 tons. The average quantity of coal gas made per ton of coal carbonized was 12,803 c.ft., as compared with 13,166 c.ft. in the previous year. The gas unaccounted for has been 8·20 p ct. of the quantity made. The average calorific value of the gas supplied during the year was 531 B.Th.U.

The total number of meters fixed on March 24 was 55,954, of which

9903 are of the prepayment type. The actual number of consumers was 51,170. The net increase in the number of additional cooking-stoves and grillers fixed during the year is 139. The total number in use on March 24 was 24,079, excluding stoves owned by consumers. There has been a decrease in the quantity of gas consumed in houses and shops of 94,937,600 c.ft., and an increase of 17,039,500 c.ft. in mills and workshops. The number of prepayment meters in use has decreased during the year from 9944 to 9903. In order to comply with the request of the Government that outlay should be curtailed as much as possible, we have suspended the purchase of prepayment meters for the time being. The quantity of gas consumed through prepayment meters has been reduced from 112,860,600 c.ft. to 108,929,800 c.ft.

A branch of the National War Savings Association has been formed in the Gas and Water Departments; and in order to encourage prospective members, there were purchased by the Corporation 750 certificates. These are being distributed as the men become entitled to them. About 250 of the employees contribute to the scheme; and Mr. Andrew says it would appear as if a very substantial amount of loan will be taken up by the department.

HEBDEN BRIDGE AND ITS GAS SUPPLY.

The annual report of the Hebden Bridge and Mytholmroyd Gas Board shows a gross profit of £6015, and a net profit, after making the usual provisions required by the Act, of £1397, against £1773 for the previous year. The amount of stock issued is now £104,300. Altogether £52,138 has been set aside out of revenue since the concern became public property. The capital expenditure to date is £119,416.

Daylight saving, lighting restrictions, and a six weeks' strike in the clothing trade are responsible for a decrease of 13 million c.ft. of gas sold. Although 1188 tons less coal were carbonized, it cost £470 more. The Government have congratulated the Board on the valuable results obtained by washing the gas with tar for the extraction of benzol and toluol. The market for coke has been good, and high prices obtained; but this increase has been neutralized by the poor returns from tar and ammoniacal liquor.

The Chairman (Mr. J. Simpson), at a special meeting held to consider the report, referred with pride to the continued increase in the amount of gas made per ton of coal under the new system of carbonizing by vertical retorts, as compared with the old system. He said that, though the illuminating power had been decreased, this was solely due to the demands made by the Government. Coke had been sold at 2s. 6d. a ton less than most authorities retailed it at, and the Board could easily secure more for it by putting it on rail; but they had decided to look after the interests of their regular customers. He complimented the Engineer (Mr. T. H. Nield) on the success of the undertaking in a year of abnormal conditions.

QUALITY OF THE GAS AT COATBRIDGE.

The Town Council and the Gas Company.

A rather serious question as to the continued lighting of the streets with gas has arisen between the Coatbridge Gas Company and the Town Council. The Fire and Lighting Committee of the Council recently had an interview with the Chairman, Manager, and Secretary of the Gas Company in connection with a complaint as to the quality of the gas supplied for street lighting. The Committee submitted the result of tests of the gas which had been made on various occasions by Messrs. Tatlock and Thomson and the Inspector of Lighting, and an analysis of the gas made by Messrs. Tatlock and Thomson, from which it appeared that there was fully 18·5 p.ct. of atmospheric air in the sample. The Chairman of the Gas Company pointed out that the only obligation upon the Company was to supply gas according to a calorific standard, and that he could give no promise in regard to the illuminating power. The Manager of the Gas Company also repudiated as inaccurate the analysis above referred to.

The Committee, in view of the position of matters, agreed to approach the Board of Trade on the subject. At the same time they asked the authority of the Town Council to enter into an agreement with the Electric Supply Company for the lighting with electricity of 46 lamps for a period not exceeding ten years, on terms and conditions to be agreed upon; and, further, power was asked to discuss with a representative of the Company the terms upon which, on a return to the normal lighting conditions of the burgh streets being permissible, the Company would be prepared to enter into a contract with the Town Council for the whole of the public lighting of the burgh.

On being asked to homologate this action of the Committee, some discussion took place at the Town Council meeting. One member demurred to the Committee raising this question of substituting electric lighting for gas without a remit from the Town Council. It was explained that it was a matter of urgency, and that the Council were merely asked for permission to enter into these negotiations for street lighting in view of the coming winter season. Dr. O'Neill, M.P., who is a member of the Council, declared that the Gas Company were under no control whatever. He did not suppose that even the Board of Trade could control them in the matter of the illuminating power of the gas. The Company went by the powers in their Act of Parliament, which fixed the candle power at 15. The Town Clerk pointed out that the whole trend of recent legislation was to substitute a calorific for an illuminating standard. Mr. Liddle pointed out that 18½ p.ct. of air in the gas was, on last year's output of 236,000,000 c.ft., something like 45,000,000 c.ft. of air, and that the amount in money of air passing through the meters of the consumers would be something like £4500. On further discussion, the Council remitted to the Committee, with power to approach the Board of Trade..

The County Borough of Burton-upon-Trent have had printed on a convenient sized card a list of the 44 employees of the Gas Department who left their work to serve with the Colours.

SOUTH SUBURBAN GAS COMPANY AND PROTECTION CARDS.

The Military Representative (Captain H. E. Harry) applied to the Lewisham Tribunal on Monday of last week, for the cancelling of the six months' exemption granted, Feb. 12, to 29 employees of the South Suburban Gas Company—ten clerks, two collectors, and seventeen gas fitters—on the ground that protection cards had been issued by the Munitions Area Recruiting Officer.

The CHAIRMAN (Mr. F. Mead) said there seemed to be some difference of opinion as to the procedure they should adopt—whether they should accede to the application or renew the certificates and allow them to run concurrently with any other protection which the parties might have obtained in regard to these men. He criticized the system under which Government Departments had delegated their powers under the Military Service Act, and which had led to the trade cards. It was alleged that, through these trade cards being issued, matters had been in the hands of foremen and others, who had exercised the power partially, with the result that married men with families had been turned out of munition factories, and young men without families had been allowed to remain. This irregularity seemed to have been recognized; and they had now this last scheme, which seemed to make confusion worse confounded. War service certificates, trade cards, and the white list were all abolished. But men engaged in Admiralty, War Office, or munitions work, in industries dealt with in the schedule, would only be posted for service after consultation with the local representative of the Government Department concerned, which was tantamount to this representative having the high power of dispensing a person from compulsory service under an Act of Parliament. Then Enlistment Complaint Committees were to be set up to decide the status for this purpose. If a claim was made for exemption on the ground of employment in a Government Department, the Tribunal were to refuse exemption, and to refer the applicant to the local munitions area dilution officer. These cases were brought before the Tribunal because the munitions area recruiting officer had granted protection cards. Finally, they were told that, if they were in any doubt about it, they could go to the President of the Local Government Board. Four or five persons were to decide a matter which, under an Act of Parliament, was expressly within the jurisdiction of a Court of Summary Jurisdiction. What an incongruous, incompatible, inconsistent thing it was!

Captain HARRY explained that, for the working of this scheme, the four departments concerned were represented in the munitions area recruiting office. If a man had a protection card, he had no further need for any other protection.

Mr. H. J. MAY pointed out that nearly twenty of these men were gas-fitters; and he suggested that they were competing with builders in the locality. Would an application for a private gas-fitter have the same respect as had been shown to the Company?

Captain HARRY: Anyone can apply who is on public work.

Mr. WILFRID WASTELL (the Secretary of the Company) observed that no living man could understand the position in regard to this schedule; and he was not surprised at the difficulty which had been mentioned. It seemed to him, however, that the issue, so far as these 29 men were concerned, was perfectly simple. The Military Representative contended that, because the Company had been supplied with protection cards—which were a modified form of exemption—they should relinquish the protection granted by the tribunal. He (Mr. Wastell) asked that the exemption granted in February last should not be disturbed. These cards might be withdrawn to-morrow, and then there would be a waste of his time and of the tribunal's. With the exception of five, these men were over 31, and married; and they were all B2, C2, and C3.

By a majority, the Tribunal decided to cancel the certificates.

NEW CERTIFIED OCCUPATIONS LIST.

A new list of certified occupations has been issued, dated June 23, which introduces a number of changes in that of Feb. 1 last. As hitherto, the list is confined to questions of exemption coming before Tribunals, and is not affected by the Schedule of Protected Occupations (M. M. 130). The alterations include the addition and removal of various occupations, and the raising in many instances of the age limits. The inclusion of an occupation in the list does not automatically exempt the individual workmen employed in such occupation. It is necessary for each man, if he is to be exempted, to be in possession of an individual certificate of exemption, for which application should be made to the appropriate Tribunal.

The following are among the reservations in particular trades:

	* Age at which Reservation begins for: Single Men.	Married Men.
GAS-WORKS.		
Foreman	31	25
Retort-house man; chief valve man or governor-house man; water-gas man	25	25
Attendant on coal-conveyors, elevators and breakers, condensers, washers, scrubbers, and meters	31	31
Man filling or emptying purifiers, slaking lime, breaking-up, screening, and spreading iron oxide for revivification	31	31
All other classes of workmen inside the works	41	41
FERTILIZER MANUFACTURE (SULPHATE OF AMMONIA, &c.).		
Foreman; overlooker	31	27
Process man in charge of any chemical process	31	27
All other classes of workmen	41	41

* The age to be taken is the man's age at April 4, 1916.

CHEMICAL TRADES (RECOVERING BENZOL, TOLUOL, &c.).

Chemist	—	..	—
Foreman; overlooker	31	..	27
Process man in charge of any chemical process	31	..	27
Man assisting in any chemical process	41	..	33

Included in the general reservations are:

MAINTENANCE AND REPAIRING STAFF.

Mechanics, bricklayers, and other skilled or semi-skilled men wholly or principally engaged in the maintenance or repair of their employers' plant, machinery, or tools	30	..	27

SPONTANEOUS FIRING OF COAL.

The problems attached to the spontaneous firing of coal have largely been investigated from the point of view of the fires which occur in coal mines; but the phenomena of spontaneous firing are similar in relation to stacks of coal. Indeed, mining engineers are faced with the double problem. Hence gas engineers will find some matters of interest in the paper read before the Institution of Mining Engineers by Dr. J. S. HALDANE, F.R.S., last Friday week, which dealt with the progress made in this matter since the Doncaster Coal Owners' Research Laboratory was established in 1913—a date which marks the systematic investigation of spontaneous firing.

For many years there has been no practical doubt, says Dr. Haldane, that the spontaneous heating of coal is due to an oxidation process occurring under such conditions that the heat formed by the oxidation cannot escape as readily as it is liberated. When a large mass of coal is concerned, such as a stack, the conditions are more complicated than in the pit. In the case of a large mass of coal, with air passing through it constantly in a certain direction, the heat produced by oxidation in each layer of the coal is carried onwards to the next layer, and in each successive layer there is a further rise of temperature. As the course of the air current is followed, the coal in time becomes hotter and hotter, until at last it gets incandescent. This cumulative rise of temperature cannot occur in a small mass of coal; for in such a mass the temperature will be more or less equalized by conduction. The mass must be large enough to permit of very unequal temperatures at different parts. When this condition is fulfilled, and there is also practically complete external heat insulation, Dr. Haldane holds the opinion that any sort of broken coal exposed to air may fire, even though the coal would be quite incapable of spontaneous firing in a small mass with complete external heat insulation. The fires which occur in pit heaps are thought to be due almost entirely to the cumulative heating effect mentioned above; and this is a point which may well be studied by all who have to store coal in large quantities. In a deep stack of coal on the surface, it appears that there is sufficient depth for up-and down convection currents to cause cumulative heating.

The Doncaster experiments have gone closely into the nature of the chemical change in the oxidation of coal in pits; and a point in this connection also has application outside the mine. Without going too deeply into these chemical problems, reference may be made to the mysterious cases of carbon monoxide poisoning reported, for instance, among men working in coal-bunkers where no appreciable heating of coal has been observed, and yet usually the occurrence of carbon monoxide is taken as evidence of heating in coal. The reason of this is still unsolved. The practical application of the knowledge gained by laboratory investigation of spontaneous heating is mainly a matter for mining engineers *qua* the pits, and certain suggestions to this end are made in the paper. As regards stacks, however, practical experience has shown that when from any cause the temperature of broken coal has been raised, even after long previous exposure to air, spontaneous firing is apt to occur. This is now much more intelligible; for although previous exposure to air may have exhausted the substances oxidizable at an ordinary temperature, the rise of temperature renders further substances liable to oxidation, so that oxidation is again started. Coal that has been warmed by the sun, or by proximity to some source of heat, may thus easily fire under favourable conditions. In warm weather, special care is needed not to stack coal in too thick a layer, although that which has once been well exposed to air in a not too thick layer will be all the safer afterwards, so that the height of the stack can safely be added to.

An interesting discussion followed the reading of the paper.

The PRESIDENT (Mr. Wallace Thorneycroft, of Glasgow) said that pyrites used to be blamed for spontaneous combustion; and it was now clearly shown that, if finely-crushed, it was one cause. But, generally speaking, it was some other kind of material, of more than one variety, that was attacked at low temperatures by oxygen. What this material was, Dr. Haldane had cautiously avoided suggesting. The Doncaster experiments, however, had proved that coal in a fine state of subdivision was more likely to take fire than large pieces. A point not touched on in the paper was that coking coal loses its coking property to some extent after exposure to air for more or less time. The better the coking coal, the longer it would remain a coking coal after exposure. There were many coking coals; but with comparatively few did exposure absolutely destroy the coking property.

Mr. C. A. CARLOW mentioned the system adopted at his colliery for obtaining indications of the temperature of stacks. Ventilating tubes were put in and the temperature taken by placing thermometers in them. Heaps of large coal, he had proved, could be several feet higher than small coal. The temperature normally was 70° Fahr., then there might be a rise of 1° per day, and suddenly it would go to 5° per day, and continue to rise in an upward curve until 120° was reached. At this

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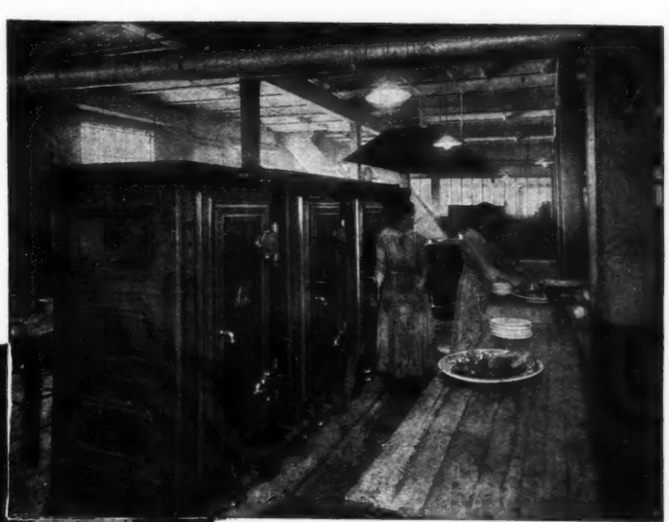

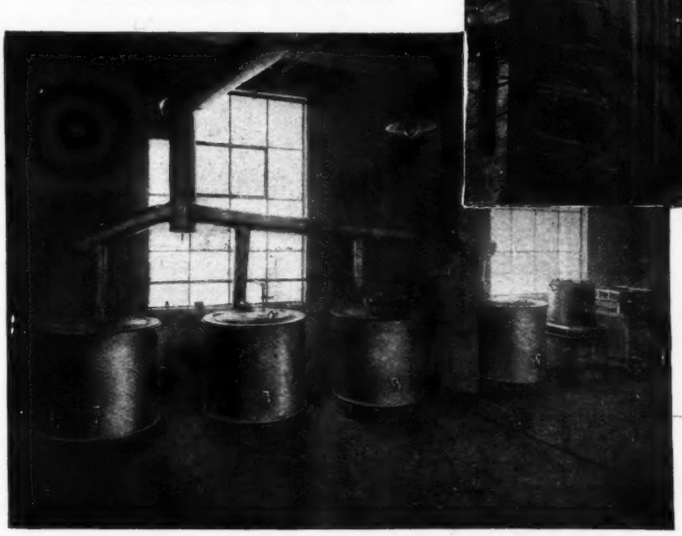

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temperature it could be depended upon that the centre of the stack would burst into flames when it was exposed.

In the course of Dr. HALDANE'S reply to the discussion, there was a reference to the equivalent orifice theory in relation to the flow of air through stacks of coal. It was agreed that, according to whether the coal was small or large, the quantity of air varied as the pressure or as the pressure squared. Nobody, however, was clear as to the size of the coal at which there was a transfer-over to the square root law. Relating to this, Dr. Haldane recalled that some years ago the South Metropolitan Gas Company issued a burner which had some porous material in it to act as a resistance. This burner passed gas proportionally to the pressure instead of proportionally to the square root of the pressure, and there was trouble. As the gas pressure went down or up beyond the normal, there was either a big flare in the burner or there was not enough gas. The square root law was more convenient, because it kept the burner steadier.

FUEL REGULATIONS IN HOLLAND.

[FROM A DUTCH CORRESPONDENT.]

The pile of letters, circulars, and regulations issued in Holland with regard to the coal shortage and the distribution of fuel, has in course of time grown to such an extent that it may, in emergency cases, serve as a last resource for fuel. Some time ago, there was a regulation ordering the formation of Fuel Committees in every town or municipality. Where there was a gas-works, a member of the board was to be elected on the Fuel Committee. These Committees have commenced their work by collecting figures concerning the number of rooms and chimneys in every dwelling, and also as to whether cooking and heating have hitherto been carried out with gas or solid fuel. For this purpose, every householder received a form to fill up with the information asked for.

Subsequently, there was a notification that in the coming winter, reckoned from Oct. 1 to April 30, only sufficient fuel for one fireplace would be definitely provided for; it being uncertain whether sufficient for a second fireplace would be available. As for houses of larger dimensions, the maximum allowance is to be for two fireplaces. The quantity calculated as sufficient for one fire throughout the winter is about 18 cwt. of anthracite. As there are also other fuels at disposal—some of them more suitable for the stoves in use—a table of relative values is included.

With regard to the restrictions in the use of gas and electricity, there is still in operation the well-known notification that, whereas for industrial purposes the economizing of coal must reach at least 25 p.ct., gas and electricity must be reduced 35 p.ct. This edict has, as already stated in the pages of the "JOURNAL," been strongly opposed by the Dutch Gas Association, but hitherto without success. The steps taken by the Association, however, seem now to have had some effect, inasmuch as there has quite lately been issued a fresh notification on the subject. In this, there is in the first place to be found an acknowledgment that cooking by gas results in a saving of coal; for it is ordered that in every case gas for cooking purposes must be furnished to those houses having a gas supply in the kitchen. Of course, there ought to be careful economy in the use of gas; but, under the circumstances named, these householders do not require any solid fuel until, at any rate, Oct. 1. The second point is that, with summer time, the use of gas for lighting purposes may cease almost completely during June and July, and to a large extent in August and September. A third regulation is that, in the coming season, everyone who has gas for room heating must continue this method, and will get no allowance for replacing gas-fires by others requiring solid fuel.

At this point, however, friendly feeling towards the gas industry seems to be exhausted, for another regulation dictates that, as far as possible, gas lighting should be supplanted by electricity; and that, wherever there are gas and electric lighting in houses, only the latter illuminant should be used. Finally, it is ordered that, where solid fuel or gas is used in industry for power purposes, these methods must be discontinued, and the plants connected with the electric stations.

We have, therefore, here a partition of the field of action—the whole heating field is given to gas, while lighting and power fall to electricity. It will be interesting to note what may be the results; and at some future time it is hoped to inform readers of the "JOURNAL" as to how far these measures result in gain or loss to the gas industry.

COAL GAS FOR MOTOR VEHICLES.

An Opportunity for Scottish Gas Engineers.

In the "Scotsman" of Thursday last, the writer of "Motor and Cycling Notes" again refers to the scarcity of petrol for commercial purposes, and the necessity—in view of the need of keeping down liabilities to foreign countries, and the activities of submarines—of utilizing to the utmost our own resources. The Petrol Control Committee urge commercial firms to reduce still further their use of petrol, and to adopt substitutes wherever they can be found. In advocating the use of ordinary town illuminating gas as a substitute, he points out (1) that the initial outlay for the necessary equipment is trifling—indeed, it may be recovered in a few months through the saving in the cost of gas as compared with petrol; (2) that no alteration to the engine is required; and (3) that gas is much cleaner than petrol. So far the idea has been adopted only in the case of chars-à-bancs; but he sees no reason why it should not be used in connection with ordinary commercial vans and covered lorries. As about 250 c.ft. of gas equals a gallon of petrol, the saving is obvious. He suggests that, as there has been no demonstration of gas-driven vehicles in Scotland, an

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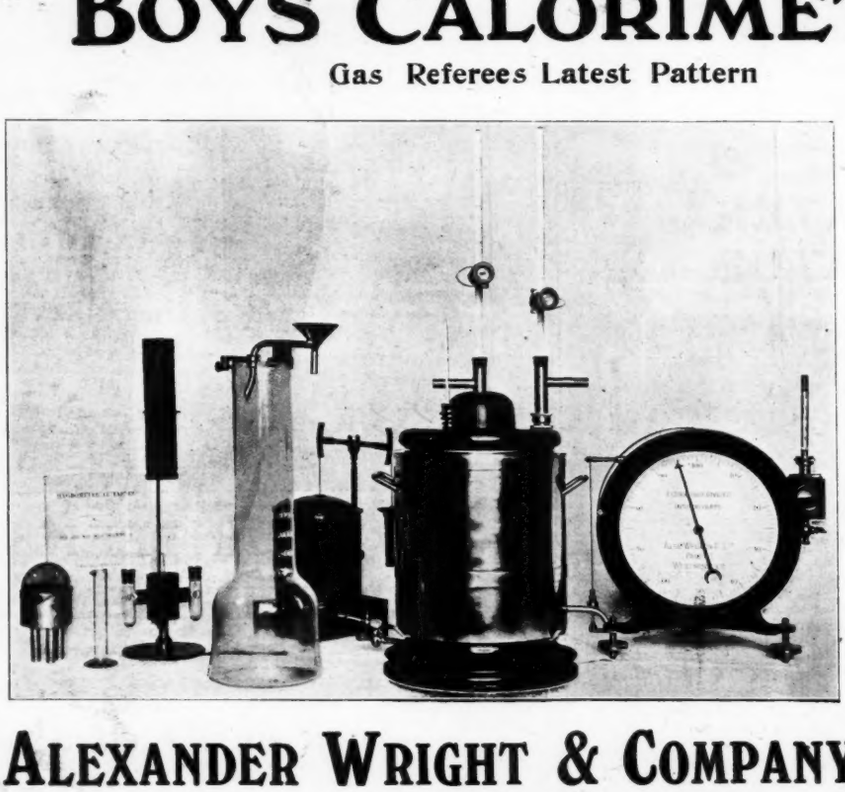

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opportunity is afforded for enterprising gas corporations to lead the way. "They are certain," he concludes, "to benefit by the change: and as at the moment it is a matter of the most urgent national importance for economic reasons alone, it is to be hoped that they will speedily give the subject attention." Perhaps in a country which produced Watt, Murdoch, and other inventive geniuses, the "man of brains" will be forthcoming referred to on p. 583 of last week's "JOURNAL."

WROUGHT-IRON v. STEEL PIPE.

Speaking at a meeting of the American Natural Gas Association, Mr. James Aston favoured wrought-iron pipe in preference to steel. Tracing the processes incidental to the manufacture of each material, he showed they differed in chemical and in physical characteristics, that steel contained manganese, and generally was not so pure as well-puddled wrought iron.

No steel process, he said, secured the incorporation of the slag that was an important feature in wrought iron, and improved its capabilities for practical service. It was a composite of iron and slag, though the usual analyses did not show the disposition of the constituents as one or the other, and the slag furnished the fibrous structure evident by fracture or etching. The strength and ductility was 10 to 15 p.ct. less in the transverse direction. That the tensile strength and elastic limit was about half the similar properties in steel might be urged as a disadvantage; but initial strength may suffer deterioration by corrosion or varied stress, to a point that enabled an originally weaker material to give better and longer service under strenuous conditions, such as were experienced by gas-main pipes.

He claimed four points in favour of wrought iron as compared with steel. (I.) Efficiency in welding, especially with acetylene, as the slag formed a natural flux, whereas steel scaled on heating. Blacksmiths did not use flux for welding wrought iron, but always borax or other material with steel; and this was not practical in the manufacture of pipes. Consequently, in the first instance the welds could be made stronger than the body of the iron. (II.) A clean, minutely accurate screw-thread, due to the fibrous character. (III.) Steel subjected to frequent repetition of shocks far below its tested strength would eventually fail through crystallization or fatigue; but wrought iron, having a fibrous and not a crystalline structure, was more durable in these respects. (IV.) Purity of composition, especially with regard to sulphur and manganese, was an important factor in retarding corrosion and pitting, similar in this respect to graphite in cast iron. Line and distribution pipe required good welds, strong threads, toughness when drilled, and the highest possible resistance to corrosion and severe strain.

Mr. F. N. Speller submitted that the question was too important to be decided by theoretical considerations. Occasional failure could be laid at the door of any material; but under the heaviest stress, the superiority of steel had been repeatedly demonstrated. Experienced drillers were willing to pay even a higher price for steel casing tube, and high-pressure gas-cylinders were preferred in seamless steel rather than wrought iron. State regulations required ammonia cylinders to be of lap-welded steel pipe, and the majority of high-pressure pipe lines, oil or gas, were of steel. He referred to the annual production of wrought iron and steel in the United States during the eleven years ended 1915, and showed that the comparative quantities had advanced from just over 1 : 2 in 1905, to nearly 1 : 8 in 1915. A canvass of 105 gas companies in New England showed that 75 used steel pipe exclusively, 13 both kinds, and only 15 pinned their faith to wrought iron. At present the demand for steel was the greater, and therefore the other might be used on that account. He questioned the analyses quoted, and claimed that the composition of steel was quite as pure, and certainly more reliable, than that of wrought iron. Practical experience was in favour of steel for autogenous welding, and it also proved that the threads on steel pipe were the stronger and the more dependable. Too sharp a root was responsible for many broken threads, and engineering societies now recommended a flatter thread, on the lines of the United States standard pattern. The slag in wrought iron was irregularly distributed, and accelerated corrosion by setting-up galvanic currents. The problem was too many sided to be settled by theory, but practical tests showed that steel was not the less durable. Nor was this point of much importance, because it was easy to use one of the many available protecting processes, especially if the material was exposed to unfavourable conditions.

Gas Companies and Electricity Deficits.—Some comment was made in the "JOURNAL" for May 22 [p. 329] upon the levying of a rate by the Beckenham District Council to make up a deficiency of income on the electricity undertaking. The South Suburban Gas Company complained, and suggested as an alternative that the Local Government Board should be asked to suspend the repayment of loans during the period of the war. The letter was placed before the Board; and they have intimated to the Council their inability to accede to this suggestion. They recommend, as an alternative, the raising of the price of current—a way out of the difficulty which was indicated in the number of the "JOURNAL" refered to.

Salaries at Oldham.—At a joint meeting of the Oldham Gas and Water Committees, the duties of the recently-appointed Distribution Superintendent and Commercial Superintendent of the departments were defined and the salaries fixed, subject to the approval of the Council. The salary of Mr. I. H. Massey (Distribution Superintendent) was fixed at £312 per annum as a maximum, commencing at this figure on receiving the approval of the Council. The salary of Mr. Ernest Parry (Commercial Superintendent) was fixed at £312 maximum, beginning at £250. It was further resolved to increase the salary of Mr. Timothy Duxbury (the Gas Engineer) from £500 to £600, subject to the approval of the Council.

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SHOW-ROOMS AND BRANCHES: 25, PRINCES STREET, OXFORD CIRCUS, W.; 82, Gordon Street, GLASGOW; 83, Old Market Street, BRISTOL; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *June* 25.

Tar products generally are unchanged on the London market. Pitch is still being exported; the material being put on board at night in consequence of the hot days. The value of pitch for early delivery is 37s. 6d. to 38s. net per ton f.o.b. makers' works. Benzene, toluene, and carbolic acid remain at the official prices; while ordinary London creosote averages 4¼d. to 4½d. net per gallon in bulk, *ex* producers' works.

With respect to sulphate of ammonia, there is some talk of export being permitted of a certain quantity. For home agriculture, nothing is doing for prompt, with a good many inquiries for next season at official prices.

Tar Products in the Provinces.

June 25.

There is no alteration in the market for tar products. The price of pitch on the West Coast is nominal.

The average values for gas-works products during the week were: Gas-works coal tar, 20s. 6d. to 24s. 6d. Pitch, East Coast, 16s. 6d. to 17s. 6d. per ton; West Coast—Manchester 15s. 6d. to 16s. 6d., Liverpool 16s. 6d. to 17s. 6d., Clyde 17s. to 18s. nominal. Benzol, 90 p.ct., North, 10¼d. to 11½d.; 50-90 p.ct., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6¼d. to 6½d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 9d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3¼d. to 3⅜d. Heavy oils, in bulk, North, 3⅜d. to 4¼d. Carbolic acid, 60 p.ct., East and West Coasts, 3s. 4d. naked. Naphthalene salts, 80s., bags included. Anthracene, "A" quality, 3d. per unit; "B" quality, 1½d. to 2d.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade is, on the whole, steady; but the lack of ready steamers at times makes some of the collieries idle where there are orders in hand that cannot thus be got away. In the steam coal trade, for best Northumbrian steams 30s. per ton f.o.b. is the current quotation; second-class descriptions are quiet at from 21s. to 22s. 6d.; and steam smalls are plentiful, and may be quoted at from 16s. to 19s. 6d. In the gas coal trade, there is a fair demand, with an adequate supply; and the consumption locally should now soon begin to increase. Best Durham gas coals are 24s. 6d. to 25s. 6d. per ton f.o.b.; for second-class varieties about 17s. 6d. is near the current quotation; and for "Wear" specials, about 28s. 6d. to 29s. Contracts for some 5000 tons have been placed; the exact price being unstated. Larger contracts seem slowly reported, and the prospects of the trade for the future appear to present themselves differently to the buyers and the producers. It is believed that the Coal Controller is suggesting alterations of detail in the distribution of the output, and coalowners seem desirous of ascertaining the probable course of the market before committing themselves much forward. As far as can be learned, such contracts as are made are at figures that are not much varied from those that ruled for the past period. Good gas coke is 31s. to 32s. 6d. per ton f.o.b. Sales to the French ports are frequent, even with the freight on the coke based on 45s. Tyne to Dunkirk.

The Underfeed Stoker Company, Ltd., have received an order for an installation of their coke burning mechanical stokers for the Brighton Corporation Power Station—supplies of coke will be obtained from the local gas-works.

Messrs. W. J. Jenkins & Co., Ltd., write to say that, in consequence of Mr. J. E. Lister, who has been managing their London Office, taking up a Commission in His Majesty's Army earlier than was expected, they have been compelled to close their London office as from Saturday last; and it will remain closed until such times as they can make arrangements for other representation.

The issue of 6 p.ct. mortgage debentures offered to tender by Messrs. A. & W. Richards, of No. 37, Walbrook, E.C., for the Sutton Gas Company was considerably over-subscribed; the tenders amounting to £16,300 for the £11,500 to be issued. The tenders ranged from £101 5s. down to the minimum of par. Applicants at £100 2s. and upwards received allotments in full.

Messrs. William Sugg & Co., Ltd., have acquired the works in Chapter Street, Westminster, formerly occupied by the British Graetzin Company, Ltd., then known as Graetzin Works, but now as Ranelagh Works, the original name. To provide additional room at Vincent Works, to meet the requirements of the Ministry of Munitions, the whole of Messrs. Sugg & Co.'s offices and show-rooms will be removed to Ranelagh Works almost immediately.

During a recent heavy thunderstorm in London, lightning fused the electric wires in a barber's shop in Conduit Street and caused a fire on the ground floor, which was, however, soon extinguished by the brigade. Earlier the same day, fire broke out at the residence of Sir R. G. Musgrave, Charles Street, Berkeley Square, and damage was caused on the third floor. A few hours before a fire had broken out on the fourth floor of the same residence. This is said to have been caused by a hot electric iron.

The Alliance and Dublin Consumers' Gas Company have started a series of popular lessons on cookery and laundry work in the model kitchen at the new show-rooms. The lessons are conducted daily from 10 a.m. to 5 p.m. by Miss Mahalan, the Company's cookery expert, and are attracting many pupils and much attention otherwise from all sections of the community. This and other methods adopted by the Directors for popularizing the use of gas for household purposes have undoubtedly had an excellent effect in stimulating interest.

BOILING WATER FOR TEAS

Richmond's "Duplus" Boiler provides a continuous supply of Boiling Water for tea-making, and is particularly suitable for the speedy service demanded in Industrial Canteens and Communal Kitchens.

Supplied in six standard sizes for providing for from 100 to 500 people.

Nos.	Height.	Width.	Capacity of Reserve.	No. of People suitable for.
	Inches.	Inches.	Gallons.	
302 A	36	30	8	100
302 B	36	33½	12	150
302 C	36	36	16	200
W 303 A	46	36	15	250
W 303 B	46	42	30	400
W 303 C	46	42	40	500

IMMEDIATE DELIVERY

THE RICHMOND GAS STOVE & METER CO., Ltd.

General Offices and Works: Academy Street, Warrington

Offices & Showrooms: 132, Queen Victoria St., London, E.C. 4

Wages Dispute at Ilkley.—An application for advanced wages by highways and sanitary workers in the employ of the Ilkley District Council, and the Council's willingness to meet them only half-way, has resulted in a strike, in which the gas-works labourers and stokers have joined. About forty men are affected, and work stopped on Thursday night. The Council are seeking voluntary help to maintain the gas service. The three local military hospitals are entirely dependent on gas for cooking. A tradesman who on Friday attempted to lead a load of coal from the railway depôt to the gas-works was met by strikers, who overturned the cart and coal into the street.

Gas the Cheapest Fuel for Bread Baking.—Quoting from the "American Gas Engineering Journal," the substitution of gas as a fuel in place of coal and charcoal, by a large bakery in New Jersey has reduced the working costs nearly 50 p.ct., apart from other advantages. According to the books, 91,000 loaves were baked by a staff of seven men during November, 1915, at a cost of £158; but in November, 1916, after the change had been made, 104,000 loaves were baked by two men, at a cost of £85. Each coal-oven would bake 40 loaves in 50 min., so that twelve ovens were necessary to turn out a batch of 480. With gas-ovens, each would bake 112 in 40 min.; so that five would produce a larger batch in less time. The premises, too, could be kept clean with much less effort.

Meter Inspector's Appeal Dismissed.—At the West Riding Appeals Tribunal at Leeds, the appeal on behalf of a Wetherby gas-meter inspector for exemption until a new man could be made accustomed to the work, was dismissed; grace being given until July 16. It was stated that the inspector examined 16,000 meters in fifteen townships.

Bingley Gas Undertaking.—The financial statement in connection with the Bingley District Council gas undertaking, submitted last week by Mr. T. Turner (Chairman of the Committee), showed that the sales of gas totalled 120,806,300 c.ft., a decrease of 10,000,000 c.ft. on the previous year, which was attributed largely to the lighting restrictions and daylight saving. The gas profits amounted to £2433; the net profit after allowing for interest and sinking fund being £1303. Residuals had realized £6252, against £5533; the increase being due to the advance in the market value of coke. The total cost of production had been £14,634, against £12,997, due to extra cost of materials and advanced wages. Coal delivered at the works totalled 11,469 tons, a decrease of 1837 tons; but it cost £1312 more. The reserve fund now stood at £3348, but would be reduced to £2400 when the new benzol recovery plant had been paid for. The capital debt had been reduced to £13,102. The Chairman thought the Council would agree that the position was satisfactory; but no hope of a reduced price of gas could be held out, owing to the high cost of coal.

STOCK MARKET REPORT.

THE Stock Exchange has had another terribly quiet week, and things seem to be getting duller and duller. Complaints on all sides were never more bitter, in view of business dwindling away to next to nothingness. As to a six-day week, the chances are that scarcely one member could now be found who would be in favour of re-opening on Saturday—it would only be adding a void to vacancy. But, in spite of the depressing inactivity, markets were not really weak. It is true they had opened rather doubtfully; but, as signs and indications gathering from day-to-day seem to impart some rays of confidence as to prospects, so firmness increased, and at the close some degree of cheerfulness obtained. Chief among factors of confidence was the improved aspect of Russian affairs. Cheaper money, too, was scanned on the financial horizon; but it is still a little way off.

The gilt-edged division, after an irregular start, settled down to a good course. Home Government issues were very firm. The War Loans went well, especially the old 4½ p.ct., which caught up the 5 p.ct. in price. Indian issues improved. Home Rails were very little touched; but they stood firm, especially the prior charges. Americans were irregular; but Canadians held fairly steady. Argentines improved, crop prospects being reported as being favourable.

In the Foreign Market, the great feature was the recovery in Russians, which had an unchequered progress from start to finish. Among the rest, French, Brazilian, and Japanese were in favourable regard. South Africans oscillated almost daily. The Miscellaneous Market was dull; several favourites being neglected.

Business in the Gas Market suffered to a fully proportionate extent from the oppressive quietude which reigned in all quarters. As to any tendency or tide, there was none—it was just slack water, and prices did not move. Only one quotation was shifted, when Primitiva was made half-a-crown cheaper. The question of the German Government's action in regard to the Imperial Continental Company's Berlin works is being discussed in the local Press.

In the Money Market, there was a good demand for short loans, and firm rates were maintained. Discount terms were easier, in view of the Government's decision to issue no longer by tender and to revert to the former practice of fixed rates.

Bargains done for cash during the week were as follows: On Monday, Commercial 3½ p.ct. 66½, Gas Light ordinary 71⅜, ditto maximum 56½, ditto prefrence 72½, 73, 73¼, 73½, Primitiva debenture 78½, 78⅝, Petersfield ordinary 1, ditto preference 2. On Tuesday, Brentford "B" 80¼, 80¾, Gas Light ordinary 71½, 72½, ditto maximum 57, ditto debenture 56. On Wednesday, Gas Light Ordinary 71, 71⅜, 72, 72⅛, 72¼, Primitiva preference 57s. 6d., Redhill 62, 62½, ditto debenture, 62, 62¼, South Metropolitan 78. On Thursday, Alliance and Dublin 50⅝, Commercial debenture 51½, Gas Light ordinary 71½, 71¾, Imperial Continental 80½. Liverpool 82, Oriental 105, 105½, Primitiva preference 57s. 6d., ditto debenture 78½, 79. On Friday, Gas Light ordinary 71½, 72, Ilford debenture, 69½, Imperial Continental 79¼, Primitiva 40s., 40s. 4½d., ditto preference 60s., South Metropolitan, 77, 77½.

The Bank rate is 5 p.ct., as fixed on April 5.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When Dividend.	Previous Div or Dividend and Bonus.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p c.					
175,472	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	58—63	..
1,551,868	"	April 8	2½	5⅛%	Alliance & Dublin Ord.	59—64	50—55	50⅝
874,000	"	July 10	4	4%	Do. 4 p.c. Deb.	76—79	58—63	..
280,000	5	April 29	7½	4/6	Bombay, Ltd.	29—30	24—25	..
50,000	10	Feb. 26	16	15/-	Bournemouth Gas and Water { 10 p.c. B 7 p.c. Pref. 6 p.c. 4 p.c. Deb.	15—15½	10½—11½	..
383,110	10	"	7	7/-		13½—14	9½—9¾	..
115,000	10	"	6	6/-		..	71—73	..
159,740	—	—	—	4%		..	..	..
992,045	Stk.	Feb. 26	14	55/-	Brentford A Consolid.	261—266	81—84	..
734,920	"	"	11	53/9	Do. B New	204—209	79—82	80½—80⅞
55,000	"	"	5	5%	Do. 5 p.c. Pref.	109—111	83—88	..
221,400	"	June 11	4	4%	Do. 4 p.c. Deb.	91—93	65—67*	..
217,380	"	Feb. 26	11	10%	Brighton & Hove Orig.	208—213	150—155	..
244,200	"	"	8	7%	Do. A Ord. Stk.	154—159	102—107	..
530,000	20	Mar. 26	12½	22/6	British	44—45	33—34	..
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	66—68	..
245,771	"	"	4	4%	Buenos Aires 4 p.c. Deb.	85—87	55—58	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	2½—3½	..
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	6—7	..
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	62—67	..
157,150	"	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	79½—80½	..
1,513,280	"	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk.	105—108	72—74	..
560 000	"	"	5½	46/8	Do. 3½ p.c. do.	103—105	66—68	66½
475,000	"	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	51—53*	51½
800,000	"	"	4	—	Continental Union Ltd.	76—79	39—41	..
200,000	"	"	7	—	Do. 7 p.c. Pref.	115—118	60—62	..
278,400	—	—	—	11½%	Croydon B and C 7 p.c.	..	170—180	..
—	—	—	—	10⅔%	Do. E	..	..	..
492,270	Stk.	—	6	5½%	Derby Con. Stk.	123—125	95—100	..
55,000	"	—	4	4%	Do. Deb. Stk.	102—104	80—83	..
1,002,180	10	July 29	10	7/6	European, Ltd.	17½—18	11½—12½	..
16,313 430	Stk	Feb. 10	4/17/4	42/-	Gas Light and Coke { 4 p.c. Ord. 3½ p.c. max. 4 p c Con. Pref. 3 p.c. Con. Deb. 10 p.c. Bonds	98—102	71—73	71—72½
2,600.000	"	"	3½	3½%		76—79	56—58	56½—57
4,002,235	"	"	4	4%		96—99	72—74	72½—73½
4,674 850	"	June 11	3	3%		72½—74½	55—57*	56
130,000	"	"	10	10%		..	..	..
258,740	"	Mar. 12	5	4½%	Hastings & St. L. 3½ p.c.	87—89	50—55	..
70.000	10	April 29	11	6%	Hongkong & China, Ltd.	16¼—16½	7½—8½	..
86,600	—	—	—	9½%	Hornsey 7 p.c.	..	125—130	..
131,000	Stk.	Mar. 12	7½	7½%	Ilford A and C.	151—154	102—107	..
65,780	"	"	6¾	5⅞%	Do. B	115—118	80—85	..
65,500	"	June 26	4	4%	Do. 4 p.c. Deb.	92—94	68—71	69½
4,940,000	"	May 14	9	4½%	Imperial Continental	150—160	79—84	79½—80½
1,235,000	"	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	62—65	..
235,242	"	Mar. 12	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	85—90	..
2,498,905	"	Feb. 26	10	5%	Liverpool 5 p.c. Ord. { A B	211 213 / 146—148	81—83	82
306,083	"	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	72—74	..
75,000	5	June 11	6	2/-	Malta & Mediterranean Met. of Melbourne { 4½ p.c. Deb.	4½—4⅝	3⅞—4½	..
250,000	100	April 1	4½	4½%		99—101	88—98	..
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11½—12	8—8½	..
1,875,892	Stk.	July 29	4½	4½%	Newcastle&Gateshd Con.	98½—99½	70—71	..
529,705	"	June 26	3½	3½%	Do. 3½ p.c. Deb.	82—83	73—75	..
55,940	10	Feb. 26	7/14/0	7/-	North Middlesex 7 p.c.	14—15	10—11	..
300,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	104—106	105—105½
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7⅞	2—3	..
60,000	50	Feb. 26	13	13%	Portsea, Island B	128—131	92—97	..
100,000	50	"	12	11%	Do. C	118—121	85—90	..
52,000	50	"	10	9%	Do. D	..	..	..
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	1⅞—2½	40/—40/4½
499,960	5	June 26	5	2/6	Do. 5 p.c. Pref.	4¾—5	2⅝—3½	57/6—60/-
521,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91—93	78—80	78½—79
—	—	—	—	4%	Do. " " 1911	..	..	..
346,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	61—67	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref. 5 p.c. Deb.	10½—11	7⅞—8½	..
125,000	50	July 1	5	5%		47—49	42—44	..
135,000	Stk.	Mar. 12	10	10%	Sheffield A	223—224	..	..
209,984	"	"	10	10%	Do. B	223—224	178—182	..
523.500	"	"	10	10%	Do. C	220—222	..	..
90,000	10	May 28	9	6/-	South African	10½—11½	8½—9½*	..
6,609,895	Stk.	Feb. 10	5/4/0	46/8	South Met. 4 p.c. Ord.	111—113	77—79	77—78
1,895,445	"	July 10	3	3%	Do. 3 p.c. Deb.	72½—74½	56—58	..
224,820	"	Feb. 26	8½	8%	South Shields Con. Stk.	157—159	140—142	..
952,795	"	"	6	48/4	S'th Suburb'n Ord. 5 p.c.	114—116	76—78	..
60,000	"	"	5	5%	Do. 5 p.c. Pref.	110—112	77—79	..
135.000	—	—	—	48/4	Do. West Kent	..	..	..
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	88—90	..
647,740	"	May 14	5	5%	Southampton Ord.	99—102	76—78	..
120,000	"	Feb. 12	7½	7½%	Tottenham { A 5 p.c. B 3½ p.c. 4 p.c. Deb.	135—138	95—100	..
782,275	"	"	6	5⅝%		115—117	68—73	..
181 255	"	June 26	4	4%		87—89	63—65*	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	60—65	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	103½—109½	89—91	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	"	Feb. 26	8⅜	80/-	Wandsworth A 5 p.c.	151—156	114—119	..
255.636	"	"	6½	65/-	Do. B 3½ p.c.	129—134	99—101	..
108,075	"	"	5/17/8	56/-	Do. C 3½ p.c.	110—115	86—91	..
353,000	"	"	6½	58/9	Wimbledon 5 p.c.	117—122	88—93	..
98,000	"	"	6⅝	65/-	Epsom 5 p.c.	121—126	96—101	..
88,416	"	June 26	3	3%	3 p.c. Deb. Stk.	66—69	51—54	..

* Ex. Div.

Price of Gas Increased at Maidstone.—The Directors of the Maidstone Gas Company have decided to raise the price of gas from 3s. 6d. to 4s. per 1000 c.ft., from the 1st prox.

Fatality at a Birmingham Gas-Works.—On Monday morning of last week, a labourer employed at the Nechells (Birmingham) Gas-Works, was so injured that he subsequently died in hospital, through being caught between the buffers of some trucks that were being shunted. He had been in the service of the Corporation for fourteen years.

Gas Profits at Cleckheaton.—The net profit on the working of the Cleckheaton gas undertaking of the Spenborough District Council for the year ended March 31 was £4077. This is equivalent to a return upon the capital invested in the works of 8·45 p.ct. The gas sold last year was about 144,000,000 c.ft., the make averaging 851 c.ft. per ton of coal more than in the preceding year, so that 867 tons less coal were used for a slightly increased output.

Price of Gas at Doncaster.—The General Purposes Committee of the Doncaster Corporation have decided that the Gas Committee shall purchase coal for storage and supply to the poorer classes during the winter, as was done with coke last winter. The General Purposes Committee discussed at length a proposal by the Gas Committee that gas charges be increased for all purposes by 2d. per 1000 c.ft.—from 3s. 4d. to 3s. 6d.—owing to the heavy increase in wages and cost of materials, the decreased value of residuals, and the fact that the balance in hand was only £640. The proposal was strongly opposed, and defeated by fourteen votes to eight.

Satisfaction at Droitwich.—The annual return of the Manager (Mr. R. Thomas) was submitted at the last meeting of the Droitwich Gas Committee, and reviewed by the Chairman (Alderman J. Gabb), who pointed out that the Manager did not recommend any increase in the price of gas, which, considering what was being done in other towns, was very gratifying. On the whole, they might say that the gas returns were highly satisfactory from all points of view, and reflected great credit on the Manager for the way he had carried out his duties. It was decided that his salary should be increased £25 per annum. The quantity of coal carbonized was 2350 tons, or 86 tons less than in the preceding year; the gas made being 28,919,800 c.ft., as compared with 29,042,200 c.ft. The make per ton, at 12,300 c.ft., showed an increase of 400 c.ft.; while the gas sold and accounted-for was 27,312,300 c.ft., against 27,634,500 c.ft., and the unaccounted-for gas was 5·5 p.ct., as compared with 4·8 p.ct. The quantity used for public lighting fell from 2,199,360 c.ft. in 1916 to *nil* in the past year.

The Arbroath Gas Committee have recommended that the price of gas for the current year be increased by 2½d. per 1000 c.ft. to all consumers, making the prices: Ordinary consumers, 2s. 11d.; prepayment consumers, 3s. 4d.; gas-engines, 2s. 6d. and 2s. 8½d.—with all discounts as formerly for large quantities.

The Portsea Island Gas Company make no charge for fixing or for the hire of the gas-stoves used in connection with the popular cookery demonstrations organized by the Portsmouth Corporation.

The Hebden Bridge and Mytholmroyd Gas Board have decided to pay an extra 2d. per shift to stokers, and an additional war bonus of 2s. per week to stokers, labourers, and boiler men. The advances will date from April 1.

Arthur Riley, a farmer, of Southowram, was last week found dead in one of his haylofts, with a pipe in his mouth attached to a gas-bracket; the gas being turned on. It was stated at the inquest that he had been depressed over financial worries, which he had unduly magnified. A verdict of "Suicide while of unsound mind" was returned.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for June 20.]

Nos. 8285—8705.

CLARKSON, F. J. R.—"Coin-freed gas-meters." No. 8368.
CUTLER, S.—"Manlids for gasholders." No. 8359.
FOX, T.—"Dry gas-meters." No. 8308.
HERSEY, S.—"Apparatus for effecting intimate contact between liquids and gases."—No. 8697.
HULL, T. G.—"Taps, cocks, valves, &c." No. 8490.
IONIDES, A. C.—"Furnace temperature regulation." No. 8623.
KIRKHAM, HULETT, AND CHANDLER.—See Hersey. No. 8697.
LANE, H.—"Manufacture of water gas with large proportion of carbon monoxide gas constituent." No. 8293.
LIQUID PURIFICATION COMPANY.—"Process for production of sulphite and sulphate of ammonia from gases and ammoniacal liquids." No. 8689.
LYMN, A. H.—"Ammonia-recovery producer-gas process, and apparatus therefor." No. 8461.
MACLAURIN, R.—"Separating low-temperature tars into components without distillation." No. 8603.
PERKIN, F. M.—"Destructive distillation of carbonaceous materials."—No. 8337.
RAMBUSH, N. E.—See Lymn. No. 8461.
ROBINSON & Co., J. H.—See Fox. No. 8308.
SEYMOUR, H. W.—See Liquid Purification Company. No. 8689.
SHAKESHAFT, C. E. M.—See Clarkson. No. 8368.
SMITH, F. G.—"Apparatus for charging gas-producers, &c." No 8474.
WELLMAN, SEAVER, AND HEAD.—See Smith. No. 8474.
WELSBACH COMPANY.—"Recovery of thorium." No. 8550.
WEST, J.—See Perkin. No. 8337.
YATES, H. J.—"Gas-burners." No. 8469.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

SECRETARY AND MANAGER. No. 6322.
ASSISTANT CHEMIST. No. 6318.
GENERAL FOREMAN. No. 6320.
REPRESENTATIVES. No. 6316.
RETORT-HOUSE FOREMAN. No. 6319.
SULPHATE MAKER AND YARDMAN. Tiverton Gas-Works.
STOKER. Tiverton Gas-Works..
STOKER. Seaford Gas-Works.

Appointments, &c., Wanted.

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BLACKPOOL GAS DEPARTMENT.

WARRINGTON GAS DEPARTMENT. Tenders by July 14.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

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By order,
WILLIAM BECKFORD LONG,
Secretary.

Chief Office: Horseferry Road,
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MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at THE MART, TOKENHOUSE YARD, E.C.

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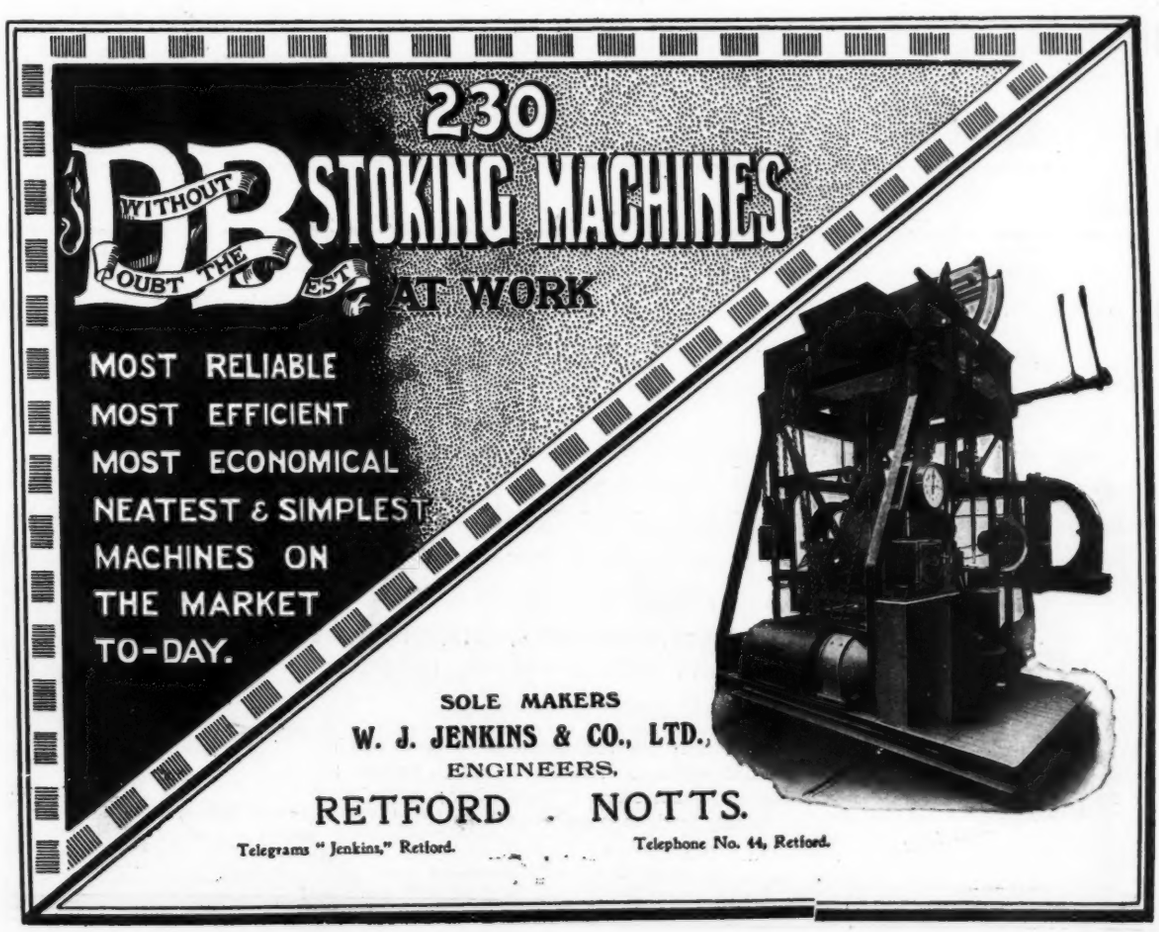

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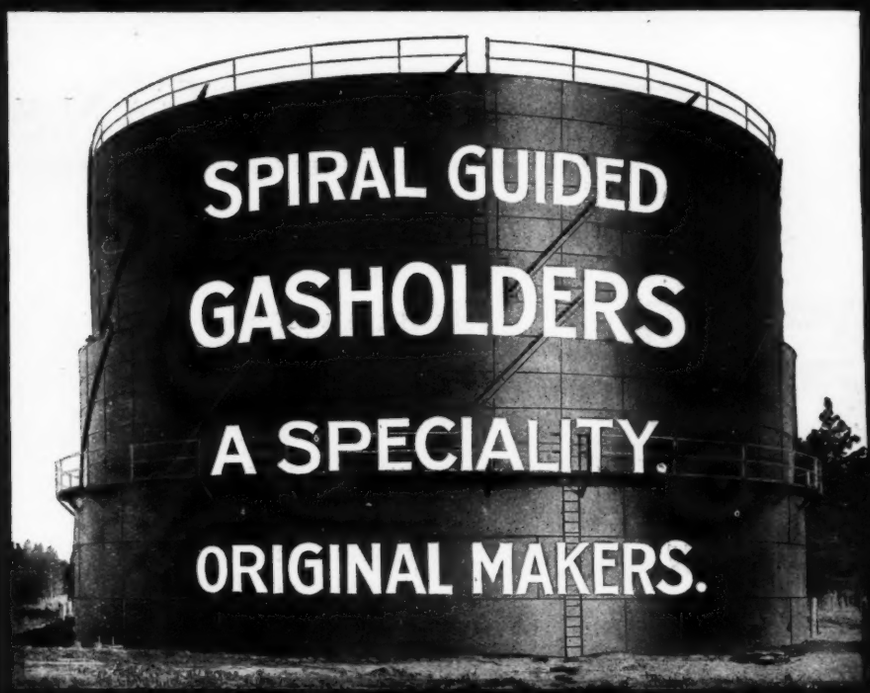

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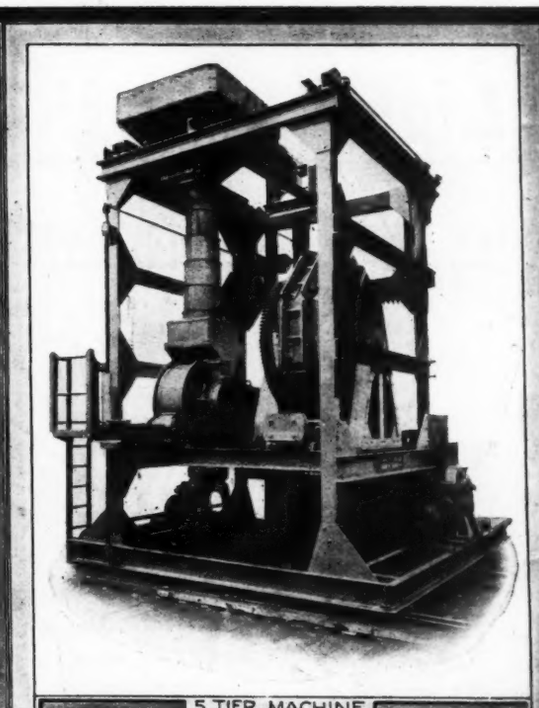

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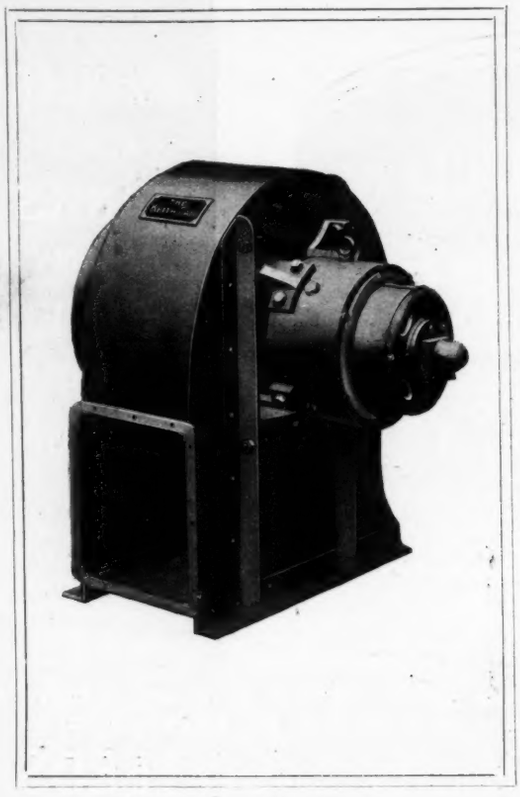

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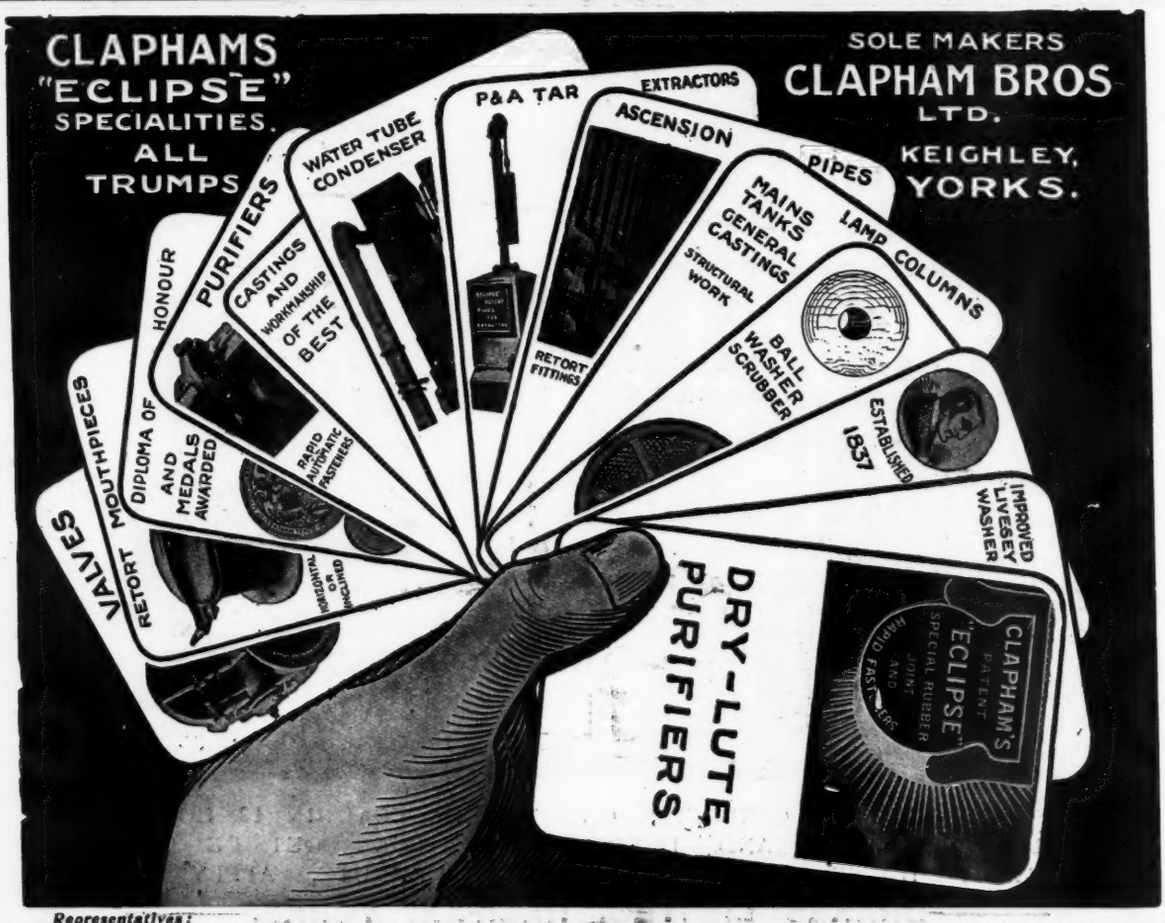

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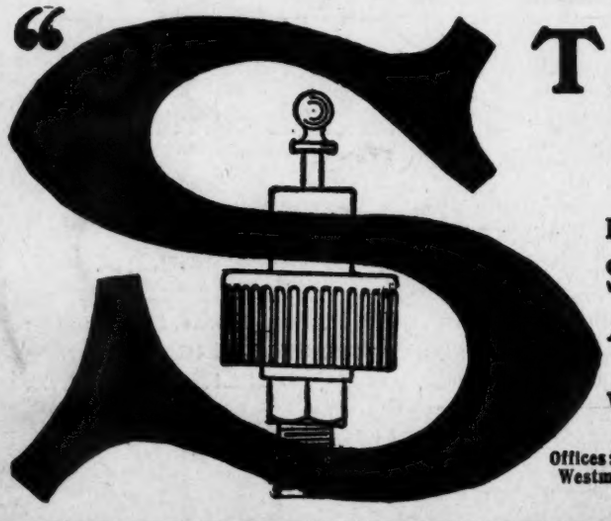

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Printed and Published by Walter King, at No. 11. Bolt Court, Fleet Street, E.C. 4. in the City of London.—Tuesday, June 26, 1917.

PRINTED BY CRAFTHOUSE
MANCHESTER